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AN INTEGRATED MODEL FOR PREDICTING SUCCESSFUL INFORMATION SYSTEMS IMPLEMENTATION

THESIS

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Abstract

The past two decades have seen a dramatic increase in the attention directed toward Information Systems (IS) implementation. In the mid-1960s a wealth of research began to center on better understanding IS success and failure. Much of this early research focused on identifying and measuring the factors believed to influence IS success. Throughout these early studies, a number of variables had been examined to determine their impact on successful implementation.

Although many approaches and strategies had been introduced, a comprehensive model for predicting implementation success had *not been* developed. There existed the need for developing a generalized instrument which could measure the contribution of participative systems design to system success as determined by user satisfaction. This paper developed such a model, by incorporating and testing nine independent variables to determine their influence on user satisfaction, without regard to a specific system.

For the purposes of this study successful IS implementation was operationalized as a self assessment measure by survey respondents. This measure was included within the survey instrument itself.

A tentative model was built that associated likely independent variables with user satisfaction. The independent variables for this study were obtained through a review of current literature dealing with IS implementation, innovation, process change, and other related studies. These variables are percieved influence, communication, role conflict and ambiguity, support, expectancy, efficiency and effectiveness, tactics, institutionalization, and position power.

This tentative model was tested in a survey of United States Air Force managers. The survey sample population consisted of Program Managers and Logistics Managers from the United States Air Force. The questionnaire itself employed a Likert-type scale for its method of measurement. Independent variables were evaluated on how well each discriminated between high and low levels of success, as determined by the survey recipient.

The purpose of this research was to develop a model that could predict successful information systems implementation. Such a model was developed. This final implementation model includes three independent variables as significant in predicting user satisfaction. These three predictors are communication, expectancy, and efficiency/effectiveness.

AN INTEGRATED MODEL FOR PREDICTING
SUCCESSFUL INFORMATION SYSTEMS IMPLEMENTATION

I. Introduction

General Issue

The past two decades have seen a dramatic increase in the attention directed toward Information Systems (IS) implementation. In the mid-1960s a wealth of research began to center on better understanding IS success and failure. Much of this research focused on identifying and measuring the factors believed to influence IS success (Ginzberg, 1981:459; Kwon and Zmud, 1987:227; Lucas, 1985:73). Throughout these studies, a number of variables have been examined to determine their impact on successful implementation. Some researchers believe that the findings of these studies have been relatively consistent, claiming that the same factors appear in study after study (Kwon and Zmud, 1987:228; Zmud, 1979:996). Others claim that the research has proven inconsistent (Ginzberg, 1981:460; Lucas, 1984:74) or even contradictory (Alavi and Henderson, 1981:1310).

Whether researchers believe these findings to be consistent, inconsistent, or contradictory is not nearly as important an issue as the fact that they all identify

one common factor -- implementation as a social change process, suggesting that many of the conflicting results of early implementation research might be explained by the impact of the interpersonal and organizational dynamics of this process on other situational factors (Alavi and Henderson, 1981:1311; Branch, 1987:49; Ginzberg, 1981:460; Hirschheim, 1985 :158; Ives and Olson, 1984:588; Kwon and Zmud, 1987:229; Lucas, 1984:73). If implementation is a social change process, then, to predict successful implementation, it is necessary to identify and measure the factors that influence this social change process. While this issue has received much attention over the past twenty years, until recently, little has been done to unify the various (change process) models already in existence (Kwon and Zmud, 1987:227).

The implementation of an information system refers to the entire change process, not just the installation and operation of a new system. Branch describes this in his framework of comparisons:

> Instead, this phase should be the execution of plans that were formed in the earlier stages of the life-cycle when the goals and objectives for the system were defined. It should include all preparations necessary to make the system successful. Such things as budgeting, training programs, and the allocation of resources fall into this stage. In addition, the execution of specific intervention strategies for the management of change will fall into this stage. (Branch, 1987:50)

Lucas also stresses the long-term nature of implementation by defining it as "part of the design of a system." He goes further to say that this "should not be confused with a step in systems design," which often results in too narrow a definition of implementation (Lucas, 1984:72).

Kwon and Zmud believe that IS implementation research has been limited by the lack of a common perspective among researchers. This belief is centered on the fact that most of these studies focus on only small portions of the larger IS implementation issue (Kwon and Zmud, 1987:231).

Specific Problem

IS implementation has been a research concern for the past two decades. Although many approaches and strategies have been introduced, a comprehensive model for predicting implementation success has not been developed. This has led to the question, "What are the variables that predict successful IS implementation?"

Research Objectives

To answer the specific problem question posed above it will be necessary to first define successful IS implementation. For the purposes of this study successful IS implementation will be operationalized as a self assessment measure by survey respondents. This

measure will be included within the survey instrument itself. A discussion of IS implementation success appears below, in the introduction to Chapter III. However, this is provided to demonstrate the use of this term in the current literature, and not intended as definitive for this study.

The guiding statement used in answering the specific problem question above will be, "Which variables have predicted successful IS implementations in the past?" From the data received, a tentative model will be built that is associated with successful IS implementation, as determined by the respondents.

Scope of Research

Ross contends that there are five major groups of factors (or entities) which influence the change process of an organization. These entities are: individual, structure, technology, task, and environment (Ross, 1987:19). These five entities first appear in a study by Kwon and Zmud, where they are identified as major groups of attributes, contributing to organizational change (Kwon and Zmud, 1987:242-243). This study will concern itself with only the first major group identified, individual factors. The remaining four entities, structure, technology, task, and environment, are beyond the scope of this study.

II. METHODOLOGY

Introduction

This study examines the relationship between selected independent variables and IS implementation. The purpose of this research was to develop a model that could predict successful implementation for information systems.

Justification

One of the most common approaches to investigating this type of problem is through the use of a survey. Often used for this form of research is the self-rated questionnaire, which in many cases employs the use of a Likert-type scale as the method of measurement.

Ives and Olson conducted a comprehensive review of the current IS implementation literature. In their study they state that. "Most of the studies reviewed are based on survey data collected after systems development has been completed" (Ives and Olson, 1984:600). Of the numerous studies reviewed by Ives and Olson, more than 70% used self-rated questionnaires. Of those studies using a self-rated questionnaire, more than 50% depended on a Likert-type scale as their method of measurement (Ives and Olson, 1984:592-593).

Instrument

Likely independent variables for this study were obtained through a review of current literature dealing with IS implementation, innovation, process change, and other related studies. The questionnaire itself employed a Likert-type scale for its method of measurement. Independent variables were evaluated on how well each discriminated between high and low levels of success, as determined by the survey recipient. A seven-point summated scale contained statements about which the respondents were asked to agree or disagree. The scale was arranged in ascending order, where a scale value of 1 was equal to a strongly unfavorable attitude and a scale of 7 was equal to a strongly favorable attitude.

Scale development focused on a number of statements that met the following criteria:

(1.) Each statement was relevant to the attitude being tested.

(2.) Each statement reflected a favorable or unfavorable position on the attitude.

Validity testing of the instrument was addressed in two ways. First, the survey items were drawn from published scales. Secondly, the survey was pilot tested and revised. This pilot testing was used to refine the survey, insuring the survey statements were not confusing or misleading. This test-revise-test cycle included

test-respondent feedback on the perceived validity of the instrument.

Sample/Population

The survey sample population consisted of Program Managers and Logistics Managers from the United States Air Force. Specifically, the respondents were students of the Air Force Institute of Technology's professional continuing education (PCE) classes on Acquisition Planning and Analysis (known as Systems 200 or SYS 200) and Logistics Management (known as Logistics 224 or LOG 224). This convenience sample was chosen for representativeness of the systems acquisition and the logistics management community.

Systems 200 is a three week course that presents a wide variety of approaches to the systems acquisition process. The student enrolled in SYS 200 works directly in a Systems Program Office (SPO), usually in a functional area such as engineering and testing, or in staff offices located in Washington D.C.

Logistics 224 is also a three week course; it presents critical examinations of the interrelationships and interdependencies that prevail in strategic, support, and operational logistics. Students enrolled in LOG 224 work in various Air Logistics Centers located around the country.

These courses are multi-disciplined in nature and draw students from a varied cross section of systems acquisition and logistics management personnel. These students come from all areas of the country. These officers were away from their normal work place environment. This reseacher observed that this acted to free them to respond in an autonomous manner. This provided for a quasi-representative convenience sample of information systems users.

Model

There exists the need for the development of an generalized instrument which can measure the contribution of participative systems design to *system success* as determined by user satisfaction. This chapter develops such a model, by incorporating and testing independent variables to determine their influence on user satisfaction, without regard to a specific system.

Data Collection Plan and Statistical Tests

Data obtained through the survey method presented above consisted of (rank ordered) quantitative variables. A multiple regression model was created and include each of these variables. The dependent variable, IS implementation success, was assigned a value of 1, and non-IS implementation success, was assigned a value of 0.

The SAS statistical analysis package was employed to perform a Pearson product-moment correlation analysis, an Rsquare (R^2) analysis, and a multiple regression analysis.

The SAS PROC CORR procedure computes correlation coefficients between variables. Correlation measures the magnitude of the linear relationship between two variables. If one variable can be expressed exactly as a linear function of another variable then the correlation is 1 (or -1) depending whether the two variables are directly related or inversely related). A correlation of zero between two variables means that each variable has no linear predictive ability for the other. If the values are normally distributed, then a correlation of zero means that the variables are totally independent of one another (SAS, 1985:861).

The SAS PROC RSQUARE procedure selects optimal subsets of independent variables in a multiple regression analysis. The RSQUARE procedure finds subsets of independent variables that best predict a dependent variable by linear regression in the given sample. This procedure performs all possible subset regressions and prints the models in decreasing order of R^2 magnitude within each subset size. This, combined with Mallow's C_p statistic computed for every regression equation that is

fit, would suggest a best fitting model where C_p is barely less than $`_p`$.

Mallow's C_p statistic is another criterion for selecting the model. C_p is a measure of total squared error. When C_p is graphed with the independent variables $`_p`$, Mallow's recommends the model where C_p first approaches $`_p`$. When the right model is chosen, the parameter estimates are unbiased, and this reflects in C_p near $`_p`$.

The SAS PROC STEPWISE procedure was used to help determine the multiple regression model. The PROC STEPWISE procedure provided a useful method for determining which variables should be included in the model. This procedure was most helpful in the exploratory analysis where the initial multiple regression model was used to test for predictor validity, identifying those individual variables that prove statistically significant (McClave and Benson, 1985:737). Mallow's C_p statistic and stepwise regression procedures were used to test for autocorrelation, nonconstant variance, and multicollinearity of the random error.

Multicollinearity exists when independent variables are correlated with each other. When this occurs in a model, the independent variables in question are considered to contribute redundant information. One of

the ways to determine which of the independent variables to include is by using stepwise regression.

The stepwise method of regression analysis began with no independent variables in the model. For each of the independent variables SAS calculated an "F" statistic that reflected the variable's contribution to the model if it were included. Variables were added one by one to the model only if that variable's "F" statistic was significant at the predeterminded entry level (SLENTRY=.15). After a variable was added to the model, the stepwise method looked at all the variables already included in the model and deleted any variable that did not produce an "F" statistic significant at the predetermined stay level (SLSTAY=.15). Only after this check was made and the necessary deletions accomplished was another variable added to the model. The stepwise process ended when none of the variables outside the model had an "F" statistic significant at the entry level and every variable in the model was significant at the stay level.

III. ANALYSIS OF THE LITERATURE: IMPLEMENTATION

Introduction

This analysis of the current literature will focus on identifying individual factors potentially influencing IS implementation. The sources largely come from two fields of study, IS technology and organizational behavior.

Conceptual Foundation

Many researchers are guilty of speaking of implementation success without actually defining the term. Most postulate what successful implementation might be by enumerating specific criteria that it should contain, then testing for these criteria. (Sanders and Courtney, 1985:80).

Kwon and Zmud point out that previous years of research have yielded only fragmented IS implementation models "following quite narrow research perspectives" and that "no consistent definition of IS implementation has taken root" (Kwon and Zmud, 1987:228). They divide the IS implementation literature into five distinct research streams: factors research stream, mutual understanding research stream, process research stream, political research stream, and prescriptive research stream (Kwon and Zmud, 1987:228). This research agrees with Kwon and

Zmud, (that no consistent definition of IS implementation exists); however, this research does not follow the premise of five research streams above. These well-defined research streams provide too narrow a view of the literature, since much of the IS implementation research does not fit neatly into only one research stream.

For example, Kwon and Zmud place the Ginzberg, 1981 article in their process research stream (Kwon and Zmud, 1987:229) but this article could fit any of their research stream categories. Ginzberg's article delineates user expectations as factors, allowing it entry into the factors research stream. The article also relies heavily on designer (developer)- user interaction, a key determinant of the mutual understanding research stream. These user expectations and interactions can be associated with the motives and consequences that define the political research stream. The discussion portion of Ginzberg's article is prescriptive in nature; placing it in the prescriptive research stream (Ginzberg, 1981:460, 475-476).

Although this current research follows the basic premise of Kwon and Zmud (that no consistent definition of IS implementation exists), this analysis of literature will not use the five research streams presented previously. This analysis of literature will be developed using an integrated approach. Article clusters will be

identified regardless if the emergent clusters cross previously defined boundaries.

Analysis of the Literature

IS implementation represents a major organizational change; the model most commonly used to represent this change is Lewin's three stage model (Davis and Olson, 1985:348).

The three stages of Lewin's model consist of:

1.) unfreezing -- creating a climate for change

2.) change -- analysis, design, development, and installation

3.) refreezing -- institutionalize new system (Lewin, 1947:26-31).

Lewin's three-stage paradigm was eventually replaced by (or used in conjunction with) the Kolb and Frohman seven-stage model. The seven-stage model, which diagrammed a "process of planned change," contains the following implementation stages: scouting, entry, diagnosis, planning, action, evaluation, and termination (Kolb and Frohman, 1970:53).

Hirschheim addresses planned changed models with regard to implementation and counterimplementation strategies:

> These planned change models provide an interesting approach for dealing with resistance to change and are potentially helpful when considering office

automation implementation. They are, however, somewhat general and assume a rationality on the part of organizational members which is unlikely to be valid. Moreover, they miss the plurality of the office. Implementation is more political than these models allow for, as can be noted through the view of counterimplementation strategies (Hirschheim, 1987:164).

The planned change model is frequently used in IS implementation research studies where individual or user-type factors are involved (Alavi and Henderson, 1981:1311; Keen, 1975:22-23) or associated with risk factors and uncertainty (Alter and Ginzberg, 1978:26).

This has led to a variety of studies centering on the individual. Ross investigates these individual factors by building on the work of Kwon and Zmud (Ross, 1987:20), where individual factors are subdivided into four attributes: job tenure, cosmopolitanism, education, and role involvement (Kwon and Zmud, 1987:234). Ross included another variable entitled attitude, that was not present in Kwon and Zmud's work. This added variable of Ross's has been omitted in this research, due to its lack of content and its redundancy with the variable entitled cosmopolitanism. Of the remaining variables, job tenure will not be considered due to the lack of information available on this variable. As Ross points out, "None of the research literature encountered for this thesis addressed job tenure as a significant factor..." (Ross, 1987:22). There is, however, a wealth of research to

support the three remaining individual factor variables, which are presented below.

Cosmopolitanism. "Associated with receptivity to change" is cosmopolitanism (Kwon and Zmud, 1987:234) and the lack thereof, resistance to change. Resistance to change is a normal reaction (Hirschheim, 1987:159) that may manifest itself in a number of ways such as hostility, frustration, and conflict (Fried, 1972:15-16). Damanpour refers to this receptivity to change as professionalism, "professionalism brings to the organization greater boundary-spanning activities, a sense of self-confidence, and commitment to moving beyond the status quo. These conditions are conducive to adoption of innovations" (Damanpour, 1987:679).

Education. This was mentioned only with regards to training, and is addressed in the literature as a variable in new system usage. This was mentioned in the DSS usage study by Fuerst and Cheney:

> That the user training during the implementation process was important in both general and specific DSS use indicates the important impact of training on usage (Fuerst and Cheney, 1982:566).

Education, in the form of training was also mentioned by Gosler and others, "We therefore suggest that DSS training be coordinated with decision training in order to realize the potential of DSSs . . ." (Gosler and others, 1986:79).

However, education (other than its association with DSS training) was rarely discussed in the literature. According to Ross in his review of current literature, "education received little mention" (Ross, 1987:22).

Role Involvement. In the literature, role involvement has received much attention usually associated with participation or user influence. There exists a well-established relationship between user influence and IS implementation success (Edstrom, 1977:605). This relationship appears to be tied to communication, as confirmed by Edstrom. "Ineffective communication as measured by our indicator shows a significant negative association with success" (Edstrom, 1977:605). This is further supported by Ebadi and Utterback. In their analysis of findings they state that project success increased as communication frequency increased (Ebadi and Utterback, 1984:579). Communication and other participative techniques can be powerful means for change, now that the influential conditions for participative management have been identified (Marguiles and Black, 1987:385, 408).

Conclusion

Much of the implementation literature reviewed by previous authors has clustered into the categories of receptivity to change and role involvement. A second

literature review was undertaken (dedicated specifically to these two categories) to help identify which independent variables were necessary for developing the causal model. Since much of the recent literature dealing with user involvement and change receptivity is included in participative decision making and participative systems design literature, the following chapter focuses on these areas.

IV. ANALYSIS OF THE LITERATURE: USER INVOLVEMENT

Introduction

Participation has been widely expounded as an effective approach for implementing organizational change and development. This is also true of the area of computer-based information systems (CBIS), where researchers and practitioners argued that user involvement is a key to success (Edstrom, 1977:589).

However, recent literature has begun to question this enthusiastic endorsement. Ives and Olson found:

> . . . that much of the existing research is poorly grounded in theory and methodologically flawed; as a result, the benefits of user involvement have not been convincingly demonstrated (Ives and Olson, 1984:586).

It appears that beliefs for or against participation are based on intuition rather than on empirical grounds (Hirschheim, 1985:295). Edstrom points out that the measures of outcomes of many of these studies are perceptual measures rather than measures of objective criteria (Edstrom, 1977:589-590). Perhaps Anderson states the consensus of current thought best:

> There is widespread support for the concept of participation in systems design and development, but inconsistent evidence as to its contribution to system success (Anderson, 1985:201).

This chapter reviews the current literature regarding user involvement and participation.

Specifically, participative decision making (PDM) and participative systems design (PSD) with regard to organizational change and development.

Participative Decision Making

Participative decision making has been defined as "joint decision making . . . [and] . . . refers specifically to participation in the process of reaching decisions" (Locke and Schweiger, 1979:274). This broad view of participative decision making has been further subdivided by Ives and Olson. Building on the earlier work of Locke and Schweiger, Ives and Olson contend that user involvement is a specific area of participative decision making. This specific area is one in which users and systems designers substitute for supervisors and subordinates, thus improving the quality and/or acceptance of the system (Ives and Olson, 1984:587).

User involvement/participative decision making is generally predicted to increase cooperation, motivation, satisfaction, and productivity (Anderson, 1985:202; Hirschheim, 1983:317-318; Ives and Olson, 1984:587-588; Marguiles and Black, 1987:386; Sashkin, 1982:17). However, this has not been the conclusion of current research.

Current research shows that there is little or no support between user involvement and a positive

relationship with system usage (Anderson, 1985:201). In their summary research of the results of twenty-two studies, Ives and Olson state:

> The benefits of user involvement have not been strongly demonstrated. Of 22 studies, eight claim to demonstrate a positive relationship between user involvement and various measures of system success, seven others present mixed results: and results from the final seven are negative or nonsignificant (Ives and Olson, 1984:600).

The conclusions presented in the extensive benchmark study of Locke and Schweiger profess that, "the evidence indicates that the effectiveness of PDM depends on numerous contextual factors." They go on to say:

> If the effects of of PDM depend upon the context in which it is used, it follows that PDM might be not only ineffective in some circumstances, but might be actually harmful. For example, it could lead to excessive intragroup or intergroup conflict caused by such factors as fundamental value differences or the resentment of members whose ideas are rejected. Group cohesion fostered by PDM may work against the goals of the organization instead of for them. Conformity and group think fostered by group pressures could lead to poor decision quality, especially if these pressures intimidate the most knowledgeable members or lead the other members to ignore their ideas. The time requirements of PDM could result in harmful delays. The ubiquitous use of PDM could retard the development and emergence of leaders, and the leaders who do emerge may be too emotionally involved in their groups to make objective decisions, especially if the decisions are tough or unpopular (Locke and Schweiger, 1979:314).

Although there appear to be differing views on the effectiveness of participative decision making, Sashkin reminds his readers that we are dealing in the realm of "probability sciences." As such, any knowledge gained

increases our chances of effective management, but does not guarantee it (Sashkin, 1982:Preface).

Participative Systems Design

Participative systems design refers to the handling of responsibilities for design and means of introduction of a new system to that group of workers who must use the system (Hirschheim, 1983:317). In PSD users take the lead in the development process (Hirschheim, 1985:296); it is a true socio-technical concept involving both human and non-human resources.

Hirschheim seems to have developed the participative systems design concept in an evolutionary fashion. In his first of the two articles cited above he begins by describing participative decision making (Hirschheim, 1983:317-318). He hints that the approach he is describing goes one step further than the current view of PDM. He follows this up by introducing a difference between content and user involvement (Hirschheim, 1983:318, 321, 325).

In Hirschheim's second article (Hirschheim, 1985:296) the earlier differentiation between content and user involvement is expanded. He delineates user involvement to coincide with the Mumford (Mumford, 1981:11) categories of "Consultative, Representative, and Consensus" (Hirschheim, 1985:296; Ives and Olson,

1984:590). At this same point Hirschheim also redefines content as referring to the "subject matter under consideration", however this revised definition appears to be rather down-scaled from his original definition:

<u>Content of participation</u>. Hirschheim's view of participative system design, that it is, new and different from participative decision making appears to be flawed.

> Participative systems design tends to broaden the scope of what is being designed or introduced. Instead of addressing only the technical characteristics it also tries to introduce social and job considerations. This is the so-called "socio-technical system" ideal (Hirschheim, 1983:321).

While Hirschheim's ideas appear valid, this approach is not entirely new. Locke and Schweiger utilized the concepts of both content and degree of participation (user involvement) to define participative decision making.

"PDM can also vary in content according to the type of issue involved. The types of decisions which might be included in PDM schemes generally fall into four broad categories" (Locke and Schweiger, 1979:276).

"Participation can vary in degree . . . the standard continuum goes from no participation . . . to various degrees of consultation . . . to full participation" (Locke and Schweiger, 1979:276).

Conclusion

The research reviewed is helping to shape the current understanding of participation and its use in implementing organizational change and development.

Present research has tested several theoretical models, however, much of the research to date has proved inconclusive. There still exists a need for empirical assessment of a conceptual model (Jackson, 1983:18).

To understand the significance that user involvement and participation have upon implementing new information systems, a new conceptual model is developed in Chapter V. This model focuses on the specific variables associated with participative decision making that could predict successful information systems implementation.

V. Building the Model

Introduction

Present research has tested several theoretical models of the effects of participation on a variety of factors. However, much of the research to date has proved inconclusive and there still exists a need for empirical assessment of conceptual models (Jackson, 1983:18).

Ives and Olson encourage attempts to adopt a standardized model that will facilitate cross-study comparisons of participative systems design (PSD) and its effect on MIS success. Several efforts to form valid generalizable measures of information system satisfaction are currently under development, however the typical information system satisfaction measure is not usually generalizable outside of the particular system for which is is developed (Ives and Olson, 1984:600). The literature review has, however, led to the development of the following tentative model.

As mentioned above, there exists the need for the development of a generalized instrument which can measure the contribution of participative systems design to system success as determined by user satisfaction. This chapter develops such a model, by incorporating nine factors as independent variables which will be tested to

determine their influence on user satisfaction, without regard to a specific system.

These independent variables are: perceived influence, communication, role conflict and role ambiguity, support, expectancy, efficiency and effectiveness, introduction tactics, insitutionalization, and position power. The justification for their inclusion in this model, and their definitions follow below.

The Dependent Variable: Satisfaction with IS

Locke and Schweiger contend that from an organization's perspective, satisfaction must be considered a means to an end -- a necessary condition for long-term profitability (Locke and Schweiger, 1979:328). They cite a variety of sources in their review of the literature, to show that participative approaches to systems design are superior to the directive approaches, but the evidence is rather weak. Over 40 percent of the studies showed no general superiority of PSD over other approaches (Locke and Schweiger, 1979:316).

Other researchers view participation as a means for improving satisfaction (Marguiles and Black, 1987:408) which is used as a crucial measure of information system success.

The perceived satisfaction with the outcome of the system is certainly a very important criterion of the success of the system (Edstrom, 1977:590).

Considerable research has been devoted to studying the contribution of participative systems design to system success. It appears that participation is likely to have a favorable effect on system satisfaction (Anderson, 1985:205).

Independent Variables

Perceived Influence. The belief that one can, to some degree, control one's environment, is known as perceived influence. The more one's influence can change existing practices, the more positive (satisfied) will be the individuals adoption of the systems design (Edstrom, 1977:592).

This concept of perceived influence is an important mediator and a good predictor of satisfaction (Jackson, 1983:12-14), but it is limited to the perceived influence that one has of oneself.

The success of PSD depends on the two important roles of sponsor and facilitator. The sponsor advocates, encourages, and is responsible for the use of the approach. The facilitator acts as a consultant and helps the process flow smoothly (Hirschheim, 1985:299).

Edstrom supports this view in that "the influence of the user and . . . the specialist [facilitator] is essential to the success of a MIS development project." He goes on to say that the influence of the sponsor seems to be crucial due to his combination of power, perspective, and authority (Edstrom, 1977:592,606).

Research Question 1. How does the influence that an individual perceives oneself (and others in the organization) to have, relate to the perceived success of an information system's implementation?

<u>Communication</u>. Between the worker and his/her co-workers and supervisors, communication is likely to increase due to participation (Jackson, 1983:6). This appears to be a logical and rather popular belief as supported by other researchers (Edstrom, 1977:594, 604-605; Marguiles and Black, 1987:406). However, in the empirical analysis conducted by Jackson, she later states that, the predictions involving personal and job-related communications were not supported in the study (Jackson, 1983:12).

According to Hirschheim, "Participative design was reported to promote better and more effective communication" (Hirschheim, 1985:300). Due to these inconsistent findings it is difficult at best to predict the outcome of the relationship of communication to user satisfaction.

Research Question 2. How does the communication process within a workplace relate to the perceived success of an information system's implementation?

Role conflict and role ambiguity. Both role conflict and role ambiguity were hypothesized by Jackson to be negatively correlated with satisfaction. Jackson cites a variety of sources to support this negative correlation (Jackson, 1983:4-5), but to extend that correlation to include PSD would be unfounded, without further cause.

Research Question 3. Does role conflict and role ambiguity have an affect on the perceived success of an information system's implementation?

Support. This support is subdivided into two major areas, top management and maintenance. Top management support is a determinant of success in PSD, it includes: a personal interest in the project, expressed willingness to consider participative recommendations, providing project funding, hiring external consultants, and allocating manpower support (Hirschheim, 1985:299).

Support in the form of maintenance provides the potential for system success in that user commitment to the system is strengthened when information services is capable of answering questions, identifying sources of difficulty, and carrying out timely modifications (Anderson, 1985:205).

Research Question 4. How does the way that one feels about their organization (and the support that they receive from their organization) relate to the perceived success of an information system's implementation?

Expectancy. This expectancy deals directly with job design and organizational structure. It focuses on job constraints and the obstacles that employees encounter in their work, along with employees expectancy calculations.

According to Ives and Olson, advocates of job enrichment and socio-technical systems design view PSD as a way to improve productivity and employee satisfaction. A system which causes significant changes to employees' jobs is a candidate for PSD due to the resultant redesign of affected jobs, corresponding to the development of the new system (Ives and Olson, 1984:589). Locke and Schweiger cite the results of the "1948 Coch and French study" as impressive evidence that participation effectively decreases resistance to job and process changes (Locke and Schweiger, 1979:309).

Research Question 5. How do employees job constraints and expectancy calculations affect the perceived success of an information system's implementation?

Efficiency/Effectiveness. This includes a wide variety of measures that have been cited throughout the

literature such as: cost, time, quality, quantity, effort, timeliness, and others. Cost savings is a participation benefit viewed two different ways. The first is cost savings due to staff reductions (Hirschheim, 1985:299). The second is cost savings due to more efficient problem analysis and solution implementation (Marguiles and Black, 1987:406).

Improved employee productivity and system quality, have long been argued, as regular outcomes of participative systems design (Ives and Olson, 1984:589). According to Hirschheim, "Most of the organizations which experienced work pattern changes believed that the changes were for the better in the sense that the amount of routine work had been reduced" (Hirschheim, 1985:300).

Research Question 6. How do employees feelings about the effectiveness and efficiency of an information system affect their satisfaction of the implementation of that system?

Tactics. The way that new systems are introduced may have substantial impact on how they are received by users. In his comprehensive study Nutt defines several different types of tactics common in implementation. Four implementation tactics were used in ninety-three percent of the cases studied; they are: intervention, participation, persuasion, and edict (Nutt, 1986:241).

Research Question 7. How does the way that new systems are introduced affect the success of implementing new systems?

Institutionalization. This institutionalization is a critical concept in organizational change, it is the process by which changes in a social system are maintained over time. Since a failure to institutionalize or sustain new behavior clearly detracts from the effectiveness of that change (Goodman and others, 1980:216), it could prove highly significant to the overall satisfaction with a system.

Research Question 8. How does the extent to which an individual "institutionalizes" the use of an information system relate to successful implementation of that system?

Position Power. This is a vital part of group functioning. It can influence role relationships, group norms, communication patterns, and decision making. Group structure and employee attitudes are also tied to power distribution within the organization (Daft and Steers, 1986:475).

Daft and Steers describe two bases of intergroup power; control of strategic contingencies and control of critical resources. These two bases can manifest themselves in organizational settings in any of the

following ways: controlling access to information or individuals, selective use of objective criteria, controlling the agenda, or utilizing outside experts (Daft and Steers, 1986:488).

Research Question 9. How does position power relate to successful implementation of information systems?

Summary and Conclusion

To establish the causal effects that these dependent variables (reproduced in Table I) have on user satisfaction, a questionnaire was developed, which is presented in Appendix A. The effects of perceived influence, communication, role conflict/ambiguity, support, expectancy, efficiency/effectiveness, tactics, institutionalization, and position power will be examined in various organizations. The sources for each independent variable are represented in Table II.

The specific hypothesis to be tested Satisfaction = Perceived Influence + Communication + Role Conflict/-Ambiguity + Support + Expectancy + Efficiency/-Effectiveness + Tactics + Institutionalization + Position Power constitutes the model shown in Figure 1, which specifies the linkages between the nine independent variables and the dependent variable, satisfaction. Arrows specify the direction of hypothesized causal relationships.

TABLE I: RESEARCH QUESTIONS

Research Question 1. How does the influence that an individual perceives oneself (and others in the organization) to have, relate to the perceived success of an information system's implementation?

Research Question 2. How does the communication process within a workplace relate to the perceived success of an information system's implementation?

Research Question 3. Does role conflict and role ambiguity have an affect on the perceived success of an information system's implementation?

Research Question 4. How does the way that one feels about their organization (and the support that they receive from their organization) relate to the perceived success of an information system's implementation?

Research Question 5. How do employees job constraints and expectancy calculations affect the perceived success of an information system's implementation?

Research Question 6. How do employees feelings about the effectiveness and efficiency of an information system affect their satisfaction of the implementation of that system?

Research Question 7. How does the way that new systems are introduced affect the success of implementing new systems?

Research Question 8. How does the extent to which an individual "institutionalizes" the use of an information system relate to successful implementation of that system?

Research Question 9. How does position power relate to successful implementation of information systems? in various organizations.

Table II: Sources for Survey Instrument Items

Independent Variable	Source
Perceived Influence	Edstrom (1977) Hirschheim (1985) Jackson (1983)
Communication	Edstrom (1977) Hirschheim (1985) Jackson (1983) Marguiles and Black (1987)
Role Conflict/ Ambiguity	Jackson (1983)
Support	Anderson (1985) Hirschheim (1985)
Expectancy	Locke and Schweiger (1979) Ives and Olson (1984)
Efficiency/ Effectiveness	Hirschheim (1985) Ives and Olson (1984) Marguiles and Black (1987)
Tactics	Nutt (1986)
Institutionalization	Goodman and others (1980)
Position Power	Daft and Steers (1986)

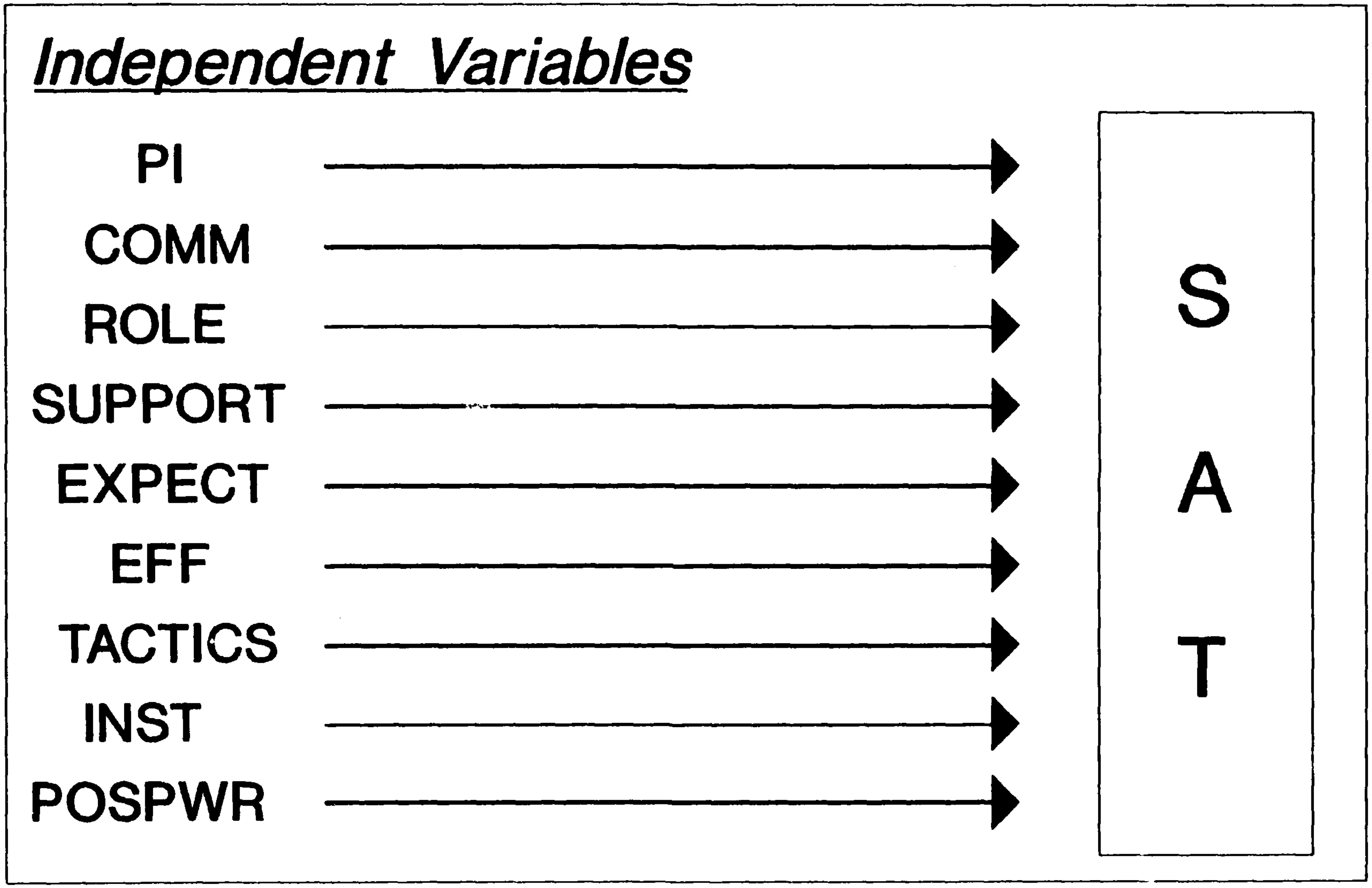

FIGURE 1. HYPOTHESIZED IMPLEMENTATION MODEL

VI. Analysis of the Data

Introduction

This chapter details further the methodology used in the data collection process and presents the results of the data analysis.

Survey Instrument

The survey instrument was designed to collect individual's views on the implementation variables presented above. The 85 survey questions were either developed from the sources cited in the review of current literature or extracted directly from those sources. Table II above, lists the sources that contributed to each independent variable which was tested in the survey.

Survey questions were developed to test each independent variable in the model. Table III shows each independent variable, the SAS variable name associated with that independent variable, the questions used to test it, and the SAS variable name associated with each survey question. The table also shows those items for the dependent (or "Y") variable, called satisfaction. The entire survey can be found in Appendix A.

Data Analysis

The following assumptions were made about the survey data collected. First, the data was treated as interval

data. The seven point Likert-type scales which were developed for this instrument assumed equal intervals between the response choices. Second, as mentioned above, the data was assumed to be a representative sample of the systems acquisition and logistics management populations.

Table III: Independent Variables, Survey Questions, and SAS Variable Names

Independent Variables	Associated Questions
Perceived Influence (pi)	1, 2, 3, 4, 5, 6, 7
Communication (comm)	8, 9, 10, 11, 12
Role Conflict/ Ambiguity (role)	13, 14, 15, 16, 17, 18, 19
Support (support)	20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35
Expectancy (expect)	36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47
Efficiency/ Effectiveness (eff)	48, 49, 50, 51, 52, 53
Tactics (tactics)	63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73
Institutionalization (inst)	74, 75, 76, 77, 78
Position Power (pospwr)	79, 80, 81, 82, 83, 84, 85

Note: SAS variable names for independent variables are in parentheses following each independent variable. SAS variable names for survey questions are not shown, they are comprised of the question number preceded by an "x" (i.e.: x1,. . . x85).

Correlation. A Pearson product-moment correlation analysis revealed correlation coefficients, the significance probability of the correlation, and the number of observations used to calculate the coefficient (under the null hypothesis that the correlation is zero), for each independent variable in the hypothesized model. This information is represented in Table IV below, the program code and complete Correlation matrix for which is contained in Appendix B.

Table IV: Correlation Analysis

INDEPENDENT VARIABLE	PEARSON CORRELATION COEFFICIENTS	PROB > |R| UNDER H0:RHO=0	NUMBER OF OBSERVATIONS
SAT	1.00000	0.0000	43
PI	0.25344	0.1054	42
COMM	0.45827	0.0026	41
ROLE	0.18532	0.2400	42
SUPPORT	0.57615	0.0001	42
EXPECT	0.46768	0.0018	42
EFF	0.76121	0.0001	43
TACTICS	0.40366	0.0080	42
INST	0.63224	0.0001	43
POSPWR	0.32214	0.0375	42

As represented in Table IV above, the independent variables with the highest correlation coefficients

(those closest to 1) are those that correlate best with the dependent variable, satisfaction. Those independent variables with the lowest coefficients (those closest to 0) are said to correlate least with the independent variable.

Each independent variable has a corresponding probability associated with it in the column listed "PROB>|R| UNDER HO:RHO=0", which is the probability of finding a greater |R| value. The |R| value is a measure of the strength of the linear relationship between two variables; the lower the |R| value the stronger the relationship, the higher the |R| value the weaker the relationship. The hypothesized model is reproduced in descending order of Pearson correlation coefficients and ascending order of the corresponding |R| values in Table V below.

There exists a one in ten probability of finding an |R| value greater than that associated with the variable "PI", and there exists more than a two in ten probability of finding an |R| value greater than that associated with the variable "ROLE."

Table V: Correlation Analysis (descending order)

INDEPENDENT VARIABLE	PEARSON CORRELATION COEFFICIENTS	PROB >|R| UNDER H0:RHO=0
SAT	1.00000	0.0000
EFF	0.76121	0.0001
INST	0.63224	0.0001
SUPPORT	0.57615	0.0001
EXPECT	0.46768	0.0018
COMM	0.45827	0.0026
TACTICS	0.40366	0.0080
POSPWR	0.32214	0.0375
PI	0.25344	0.1054
ROLE	0.18532	0.2400

Thus, user satisfaction does not appear to be correlated, in any significant degree, with either the users perceived influence (PI) or the users role conflict/ambiguity (ROLE). The implication is that a weak linear relationship exists between the dependent variable (satisfaction) and both of these independent variables.

User satisfaction and the seven remaining independent variables appear to be significantly correlated. The implication here is that a strong linear relationship exists between satisfaction and these

independent variables (EFF, INST, SUPPORT, EXPECT, COMM, TACTICS, POSPWR). However, this high correlation does not imply a causal relationship. The only conclusion that can be made from this correlation analysis is that a linear trend may exist between user satisfaction and these remaining variables. This linear trend might also be due to multicollinearity.

As stated above, multicollinearity exists when independent variables are correlated with each other. When this occurs in a model, the independent variables in question are considered to contribute redundant information. One of the ways to determine which of the independent variables to include is by using stepwise regression. Two methods of stepwise regression analysis and their results are discussed below.

<u>RSQUARE</u>. The RSQUARE procedure found subsets of independent variables that best predicted the dependent variable by linear regression. This procedure performed all possible subset regressions and prints the models in decreasing order of R^2 magnitude within each subset size, the program code and entire listing for which is contained in Appendix C. R^2, or coefficient of determination, is the square of the coefficient of correlation. It represents the proportion of the sum of squares of deviations of the dependent variable values

about their predicted values that can be attributed to a linear relation between dependent and independent variables.

Mallow's C_p statistic is another criterion for selecting the model. C_p is a measure of total squared error. When C_p is graphed with the independent variables "p", Mallow's recommends the model where C_p first approaches "p". When the right model is chosen, the parameter estimates are unbiased, and this reflects in C_p near "p". This, combined with the R^2 statistic computed for every regression equation that is fit, suggests a best fitting model where C_p is barely less than "p". The candidate models from which are reproduced in Table VI below.

Table VI: Candidate Models

IN	R-SQUARE	C(P)	VARIABLES IN MODEL
3	0.558546	3.24669	ROLE EXPECT EFF
3	0.559264	3.19101	EXPECT EFF INST
3	0.559587	3.16597	ROLE EFF INST
3	0.563543	2.85906	COMM EXPECT EFF
3	0.564308	2.79974	SUPPORT EFF INST
4	0.574863	3.98091	COMM EFF TACTICS INST
4	0.576062	3.88785	COMM EXPECT EFF TACTICS
4	0.577651	3.7646	SUPPORT EFF TACTICS INST
4	0.577700	3.76082	ROLE EFF TACTICS INST
4	0.578284	3.71551	COMM SUPPORT EFF INST
4	0.579891	3.59086	EXPECT EFF TACTICS INST
4	0.581813	3.44174	COMM ROLE EFF INST

Table VI: Candidate Models (Cont)

IN	R-SQUARE	C(P)	VARIABLES IN MODEL
4	0.582109	3.41874	COMM EXPECT EFF INST
4	0.583386	3.31973	COMM ROLE EXPECT EFF
4	0.585987	3.11793	ROLE EXPECT EFF INST
4	0.597099	2.25589	ROLE SUPPORT EFF INST
5	0.600353	4.00345	COMM EXPECT EFF TACTICS INST
5	0.603397	3.76733	COMM ROLE EXPECT EFF INST
5	0.604244	3.70156	ROLE SUPPORT EFF TACTICS INST
5	0.606492	3.52724	COMM ROLE SUPPORT EFF INST

The other major consideration used in selecting candidate models was parsimony, or economy in the use of a means to an end (resources). If entering an additional variable into the model results in an increase of the R^2 value of only six, one thousandths, then the value of such an addition would appear marginal, at best, and should be excluded. This was the case with the seventh variable entered, the most it could contribute to the R^2 value was six, one thousandths. Similarly, the maximum contribution of the sixth variable entered was only nine, one thousandths, this too was considered marginal and thus excluded.

Final Model. To further reduce the number of candidate models in the selection process, the SAS PROC

STEPWISE analysis was employed. As mentioned above, this procedure is used to determine which independent variables produced "F" statistics that were significant enough to be included in the model. Table VII shows the results of this stepwise regression, the entire listing of which is contained in Appendix B.

Table VII: SUMMARY OF STEPWISE REGRESSION PROCEDURE FOR DEPENDENT VARIABLE SAT

STEP	VARIABLE ENTERED	F	PROB>F
1	EFF	31.4039	0.0001
2	EXPECT	5.6687	0.0227
3	COMM	2.4748	0.1247

STEP	VARIABLE ENTERED	NUMBER IN	PARTIAL R**2	MODEL R**2	C(P)
1	EFF	1	0.4591	0.4591	6.96182
2	EXPECT	2	0.0736	0.5327	3.25321
3	COMM	3	0.0309	0.5635	2.85906

NO OTHER VARIABLES MET THE 0.1500 SIGNIFICANCE LEVEL FOR ENTRY

NOTE: SLENTRY AND SLSTAY HAVE BEEN SET TO .15 FOR THE STEPWISE TECHNIQUE.

As mentioned above, the stepwise method of regression analysis began with no independent variables in the model. For each of the independent variables SAS

calculated an "F" statistic that reflected the variable's contribution to the model if it were included. Variables were added one by one to the model only if that variable's "F" statistic was significant at the predeterminded entry level (SLENTRY=.15). After a variable was added to the model, the stepwise method looked at all the variables already included in the model and deleted any variable that did not produce an "F" statistic significant at the predetermined stay level (SLSTAY=.15). However, in this instance no variables were removed from the model after they were included. Only after this check was made was another variable added to the model. The stepwise process ended when none of the variables outside the model had an "F" statistic significant at the entry level of and every variable in the model was significant at the stay level.

The final model selected by the stepwise procedure had an R^2 value of .5635 and a C_p value of 2.859. There were candidate models with more impressive values, however, a quick review of the full Pearson product-moment correlation matrix found in Appendix B, will show a high tendency toward multicollinearity between those independent variables contributing to said models, thus contributing redundant information. The stepwise selection was considered to be unbiased and relatively

free from multicollinearity. The final model is Satisfaction = Efficiency/Effectiveness + Expectancy + Communication (sat= eff + expect + comm). It is graphically represented in Figure 2 below. The arrows specify the direction of the relationships. The figures above each arrow represent the Beta value of that independent variable, while the figures below each arrow represent the significance level of that variable.

Conclusions

Conclusions. In the past, IS implementation research had been limited by the lack of a generalized instrument for predicting implementation success without regard to a specific system. This research developed a comprehensive model which employs as the dependent or response variable the users satisfaction with that system. Throughout the development of this model, nine independent variables were tested to determine their significance as predictors of user satisfaction. Of the nine independent variables tested, three proved to be highly significant in predicting user satisfaction. These three significant variables are communication, expectancy, and efficiency/effectiveness.

Communication. This study has shown that there is a positive correlation (.458) between communication in the workplace and user satisfaction. This research has

also shown that communication is a significant contributor (.1247) in predicting user satisfaction. These findings suggest that increasing communication within the workplace may have a positive influence on the perceived success of the implementation of new information systems.

Expectancy. Expectancy also shows a strong positive correlation (.467) with user satisfaction and a high level of significance (.0227) as a contributor to predicting user satisfaction. This research suggests that reduced job constraints and increased expectancy calculations have a positive influence on the perceived success of the implementation of new information systems.

Efficiency/Effectiveness. The highest correlation in this study (.761) exists between efficiency/-effectiveness and user satisfaction. Efficiency and effectiveness is the single most significant contributor to the model (.0001). Since a significance level of

independent variable with a greater "F" statistic is one in one, ten-thousandths, it is reasonable to conclude that employees feelings about effectiveness and efficiency have a strong positive influence on the success of the implementation of new information systems.

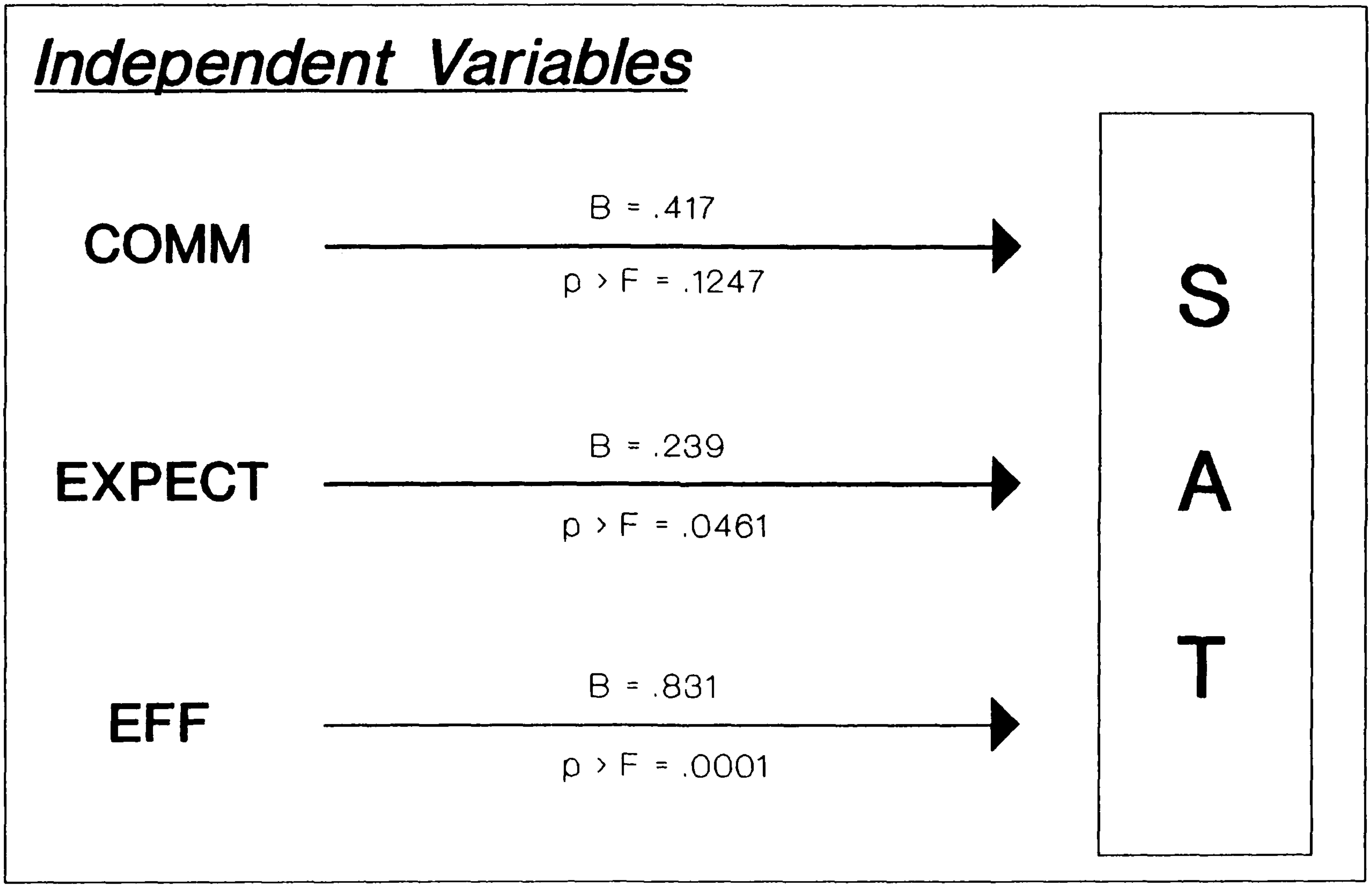

FIGURE 2. FINAL IMPLEMENTATION MODEL

Recommendations

Although the final model does not account for forty-four percent of the total variation of the dependent variable, it does represent fifty-six percent of the actual variation of the dependent variable, satisfaction. It is the opinion of the author that a model which represents fifty-six percent of the variation can be useful. The use of this model is limited, however, and it is the recommendation of the author that this model be used only as a guide until further empirical testing can be accomplished. Further empirical testing should be conducted on a much larger sample population. Until such time, the model should prove helpful when implementing new computer-based information systems.

APPENDIX A: INFORMATION SYSTEMS SURVEY

KEYWORDS

The following are definitions of key words that you will see throughout the questionnaire.

1. Sponsor: The person who advocates, encourages, and is responsible for the use of the system's implementation.

2. Facilitator: The person who acts as a consultant and helps the implementation process flow smoothly.

3. Information System: A computer-based set of organized procedures that provide information for decision making and/or control for the organization.

INSTRUCTIONS

This questionnaire contains 81 items (individual "questions"). All items must be answered by filling in the appropriate spaces on the machine-scored answer sheets provided. If for any item you do not find an answer that fits your situation exactly, use the one that is closest to the way you feel. There are no right or wrong answers.

Please use a "soft-lead" (No. 2) pencil, and observe the following:

1. Make heavy black marks that fill in the space of the answer you select.

2. Erase cleanly any answers that you wish to change.

3. Make no stray markings of any kind on the answer sheet.

4. Do not staple, fold, or tear the answer sheet.

5. Do not make any markings on the questionnaire booklet.

PLEASE KEEP IN MIND ONLY ONE SPECIFIC COMPUTER-BASED INFORMATION SYSTEM, AS THE BASIS FOR YOUR ANSWERS, THROUGHOUT THIS SURVEY.

PERCEIVED INFLUENCE

This section of the questionnaire deals with the influence that different individuals have had upon the development of the new system.

Use the rating scale below to answer the following three (3) questions.

1 = Not at all
2 = Very little
3 = Somewhat
4 = To a moderate degree
5 = A great degree
6 = A very great degree
7 = Completely

1. To what degree did your participation influence the systems development process?

2. To what degree did the sponsor's participation influence the systems development process?

3. To what degree did the facilitator's participation influence the systems development process?

Use the rating scale below to answer the following four (4) questions.

1 = Not at all
2 = Only in the beginning
3 = Early in the development
4 = In the middle of the development
5 = Late in the development
6 = Only at the end of development
7 = Throughout the entire development

4. At what point (or stage of development) was your participation most influential?

5. At what point (or stage of development) was the sponsors participation most influential?

6. At what point (or stage of development) was the facilitator's participation most influential?

7. At what point (or stage of development) were external consultants employed?

COMMUNICATION

This section of the questionnaire deals with the communication process within your workplace. Use the rating scale below to answer the following questions.

1 = None at all (or decrease)
2 = 10%
3 = 25%
4 = 50%
5 = 75%
6 = 100%
7 = More than 100%

8. How much of an increase has there been, in the amount of communication in the workplace?

9. How much of this increased communication is job-related?

10. How much of this increased communication is personal?

11. If this increased communication is job-related, how much of it is technical?

12. If this increased communication is job-related, how much of it is social?

ROLE CONFLICT/AMBIGUITY

The following items deal with your role within the organization.

Use this scale to answer the following two (2) questions.

1 = 100% decrease (or more)
2 = 50% decrease
3 = 25% decrease
4 = No change
5 = 25% increase
6 = 50% increase
7 = 100% increase (or more)

13. How much change has there been in the amount of conflict associated with your role in the organization?

14. How much change has there been in the amount of ambiguity associated with your role in the organization?

Use the following rating scale to indicate the extent to which you agree or disagree with the statements shown below.

1 = Strongly disagree
2 = Moderately disagree
3 = Slightly disagree
4 = Neither disagree nor agree
5 = Slightly agree
6 = Moderately agree
7 = Strongly agree

15. On my job, most of my tasks are clearly defined.

16. To satisfy some people on my job, I have to upset others.

17. On my job, I can't satisfy everybody at the same time.

18. Most of the time, I know what I have to do on my job.

19. On my job, I know exactly what is expected of me.

SUPPORT

This section of the questionnaire contains a number of statements that relate to feelings about your organization.

Use this scale to answer the following questions.

1 = Strongly disagree
2 = Moderately disagree
3 = Slightly disagree
4 = Neither disagree nor agree
5 = Slightly agree
6 = Moderately agree
7 = Strongly agree

20. This organization is always moving toward the development of new answers.

21. Around here people are allowed to try to solve the same problem in different ways.

22. Creativity is encouraged here.

23. People in this organization are always searching for fresh, new ways of looking at problems.

24. The leadership acts as if we are not very creative.

25. We're always trying out new ideas.

26. This organization is open and responsive to change.

27. People here try new approaches to tasks, as well as tried and true ones.

Here are more questions about your organization. Use the rating scale below to answer them.

1 = Not at all
2 = Very little
3 = Somewhat
4 = A moderate degree
5 = A great degree
6 = A very great degree
7 = Completely

28. To what extent did senior management support the systems development process?

29. To what extent was there ample funding provided for the project?

30. To what extent was there ample manpower provided for the project?

31. To what extent were ample resources provided for the project?

32. To what extent was senior management open to considering recommendations that resulted from participation?

33. How capable were/are the systems services in answering questions?

34. How capable were/are the systems services in identifying sources of difficulty?

35. How capable were/are the systems services in accomplishing timely modifications?

EXPECTANCY

The following items deal with obstacles and constraints that you may encounter in your work which inhibit good performance. Use the rating scale below to indicate how frequently each performance obstacle or constraint poses a problem for you.

1 = Always
2 = Very often
3 = Often
4 = Sometimes
5 = Rarely
6 = Very rarely
7 = Never

36. Job Induced Constraints (factors in the actual make-up of the job itself such as machine breakdown, inadequate tools and supplies, etc.)

37. Communication Obstacles (restrictions in communicating with others important to getting your job done.)

38. Administrative or Policy Constraints (rules, regulations, and requirements that make it harder to do a good job.)

39. Work Group Constraints (actions or attitudes of your immediate work group that make it harder to do a good job.)

40. Supervisor Constraints (actions or attitudes of your immediate supervisor that make it harder to do a good job.)

41. Information Systems Support (actions, attitudes, or other factors that make it harder for you to get the systems support you need, to do a good job.)

Here are some things that could happen to people when they do their jobs especially well. How likely is it that each of these things would happen if you performed your job especially well?

Again, use any number from 1 to 7 to indicate your response.

1 = Not at all likely.
3 = Somewhat likely.
5 = Quite likely.
7 = Extremely likely.

42. You will get a pay increase.

43. You will feel better about yourself as a person.

44. You will have an opportunity to develop your skills and abilities.

45. You will be given chances to learn new things.

46. You will be promoted or get a better job.

47. You will get a feeling that you've accomplished something worthwhile.

EFFICIENCY/EFFECTIVENESS

This section of the questionnaire contains a number of statements that relate to your feelings about the information system in question. Use the following rating scale to indicate the extent to which you agree or disagree with the statements shown below.

1 = Strongly disagree
2 = Moderately disagree
3 = Slightly disagree
4 = Neither disagree nor agree
5 = Slightly agree
6 = Moderately agree
7 = Strongly agree

48. The new information system is cost effective.

49. It now takes less time for me to do my work as a result of the new information system.

50. The quality of my work has increased as a result of the new information system.

51. The quantity of my work has increased as a result of the new information system.

52. My work now requires less effort as a result of the new information system.

53. My work is now more useful to the organization as a result of the new information system.

SATISFACTION

Please indicate how satisfied you are with each of the following job related items.

1 = Very dissatisfied
2 = Dissatisfied
3 = Slightly dissatisfied
4 = Neither satisfied nor dissatisfied
5 = Slightly satisfied
6 = Satisfied
7 = Very satisfied

54. How satisfied are you with your job?

55. How satisfied are you with the new information system?

56. How satisfied are you with your current position?

57. How satisfied are you with the quantity of your work?

Please indicate how satisfied you are with each of the following systems aspects.

58. How satisfied are you with the user friendliness of the new information system?

59. How satisfied are you with the speed of the new information system?

60. How satisfied are you with the accuracy of the new information system?

61. How satisfied are you with the quality of the new information system?

62. How satisfied are you with the amount of effort that it takes to use the new information system?

TACTICS

This section of the questionnaire contains a number of statements that relate to the way the new system was introduced to employees. Use the following rating scale to indicate the extent to which you agree or disagree with the statements shown below.

1 = Strongly disagree
2 = Moderately disagree
3 = Slightly disagree
4 = Neither disagree nor agree
5 = Slightly agree
6 = Moderately agree
7 = Strongly agree

63. Senior management clearly communicated that everyone was expected to make use of the new system.

64. Others explained to me how the new system could help me do my job better.

65. I understand how the new system would help me in my job performance.

66. Organizational staff members cited similar "successful systems" as justification for the new system.

67. Organizational staff members monitored users of the new system.

68. Appraisal of my performance is contingent upon my use of the new system.

69. Experts attempted to persuade me to use the new system.

70. Organizational staff members attempted to persuade me to use the new system.

71. Consultants attempted to "sell" the new system to me and other users.

72. Organizational staff members used control and personal power to force me to use the new system.

73. Direction was issued requiring adaptation to the new system.

INSTITUTIONALIZATION

This section of the questionnaire relates to your feelings about the information system in question. Use the following rating scale to indicate the extent to answer the questions shown below.

1 = Not at all
2 = Very little
3 = Somewhat
4 = A moderate degree
5 = A great degree
6 = A very great degree
7 = Completely

74. To what extent do you know how to use the new system?

75. To what extent do you actually make use of the new system?

76. To what extent do you prefer to use the new system instead of alternate methods?

77. To what extent do most of your co-workers believe that the system should be used?

78. To what extent do you you believe that systems like this one should always be used rather than alternate methods?

POSITION POWER

This section of the questionnaire contains a number of statements that relate to the power that you have within the organization and with regard to other employees. Use the following rating scale to indicate the extent to which you agree or disagree with the statements shown below.

1 = Strongly disagree
2 = Moderately disagree
3 = Slightly disagree
4 = Neither disagree nor agree
5 = Slightly agree
6 = Moderately agree
7 = Strongly agree

79. I provide a resource that is considered highly valuable to the whole organization.

80. I control resources that are vital to the organization.

81. I control the criteria that others must use to make organizational decisions.

82. I can "call in" outside experts whenever I feel that their services are warranted.

83. I "select or approve" what will be discussed in meetings.

84. I assign duties to subordinates (either directly or indirectly).

85. I can reward or punish those who work for me, as I deem necessary.

Appendix B: SAS Correlation and Stepwise Programs

S A S   L O G   VMS SAS 5.16

```
options linesize=64;

data one;
        infile datal;
        input @1 sheet_1 $8. @10 (x1-x64) (1.)
                         #2 @20 (x65-x85) (1.);

        array a {85} x1-x85;

do I= 1 to 85;

        if a {I}=6 then a {I}=7;
        if a {I}=5 then a {I}=6;
        if a {I}=4 then a {I}=5;
        if a {I}=3 then a {I}=4;
        if a {I}=2 then a {I}=3;
        if a {I}=1 then a {I}=2;
        if a {I}=0 then a {I}=1;

end;


        sat=x54+x55+x56+x57+x58+x59+x60+x61+x62;
        pi=x1+x2+x3+x4+x5+x6+x7;
        comm=x8+x9+x10+x11+x12;
        role=x13+x14+x15+x16+x17+x18+x19;
        support=x20+x21+x22+x23+x24+x25+x26+x27
               +x28+x29+x30+x31+x32+x33+x34+x35
        expect=x36+x37+x38+x39+x40+x41+x42+x43
                 +x44+x45+x46+x47;
        eff=x48+x49+x50+x51+x52+x53;
        tactics=x63+x64+x65+x66+x67+x68+x69+
            x70+x71+x72+x73;
        inst=x74+x75+x76+x77+x78;
        pospwr=x79+x80+x81+x82+x83+x84+x85;
```

NOTE: THE DATA SET WORK.ONE HAS 45 OBSERVATIONS AND 97 VARIABLES.

NOTE: MISSING VALUES WERE GENERATED AS A RESULT OF PERFORMING AN OPERATION ON MISSING VALUES.

```
EACH PLACE IS GIVEN BY:
(NUMBER OF TIMES) AT (LINE):(COLUMN).
  3 AT 24:10.
  3 AT 24:13.
  3 AT 24:16.
  3 AT 24:19.
  3 AT 24:22.
  3 AT 24:25.
  4 AT 25:12.
  4 AT 25:16.
  4 AT 25:20.
  4 AT 25:24.
  3 AT 26:14.
  3 AT 26:18.
  3 AT 26:22.
  3 AT 26:26.
  3 AT 26:30.
  3 AT 26:34.
  3 AT 27:45.
  3 AT 27:49.
  3 AT 27:53.
  3 AT 27:57.
  3 AT 27:61.
  3 AT 27:65.
  3 AT 27:69.
  3 AT 27:73.
  3 AT 28:52.
  3 AT 28:56.
  3 AT 32:16.
  3 AT 32:20.
  3 AT 32:24.
  3 AT 32:28.
  3 AT 32:32.
  3 AT 32:36.
  3 AT 30:29.
  3 AT 30:33.
  3 AT 30:37.
  3 AT 30:41.
  3 AT 30:45.
  3 AT 30:49.
  3 AT 30:53.
  2 AT 23:13.
  2 AT 23:17.
  2 AT 23:21.
  2 AT 23:25.
  2 AT 23:29.
  2 AT 23:33.
  2 AT 23:37.
```

```
2 AT 23:41.
2 AT 28:32.
2 AT 28:36.
2 AT 28:40.
2 AT 28:44.
2 AT 28:48.
2 AT 29:13.
2 AT 29:17.
2 AT 29:21.
2 AT 29:25.
2 AT 29:29.
2 AT 30:17.
2 AT 30:21.
2 AT 30:25.
2 AT 31:14.
2 AT 31:18.
2 AT 31:22.
2 AT 31:26.
1 AT 27:17.
1 AT 27:21.
1 AT 27:25.
1 AT 27:29.
1 AT 27:33.
1 AT 27:37.
1 AT 27:41.
1 AT 28:16.
1 AT 28:20.
1 AT 28:24.
1 AT 28:28.

proc corr;
        var sat pi comm role support expect eff
            tactics inst pos

proc stepwise;
        model sat= pi comm role support expect
                   eff tactics inst

proc print;
        var sat pi comm role support expect
            eff tactics inst pos
```

SAS OUTPUT

VARIABLE	N	MEAN	STD DEV	SUM	MIN	MAX
SAT	43	39.907	11.303	1716.0	15.0	60.0
PI	42	23.857	7.745	1002.0	7.0	40.0
COMM	41	15.098	4.620	619.0	5.0	24.0
ROLE	42	29.238	5.207	1228.0	17.0	41.0
SUPPORT	42	62.857	14.117	2640.0	29.0	91.0
EXPECT	42	48.190	10.500	2024.0	25.0	67.0
EFF	43	26.744	7.859	1150.0	8.0	42.0
TACTICS	42	36.619	11.770	1538.0	17.0	60.0
INST	43	20.047	7.381	862.0	5.0	33.0
POSPWR	42	28.667	9.540	1204.0	10.0	47.0

SAS

PEARSON CORRELATION COEFFICIENTS

PROB > |R| UNDER H0:RHO=0

NUMBER OF OBSERVATIONS

	SAT	PI	COMM	ROLE	SUPPORT	EXPECT
SAT	1.00000	0.25344	0.45827	0.18532	0.57615	0.46768
	0.0000	0.1054	0.0026	0.2400	0.0001	0.0018
	43	42	41	42	42	42
PI	0.25344	1.00000	0.38415	0.03231	0.23561	0.23485
	0.1054	0.0000	0.0132	0.8390	0.1331	0.1394
	42	42	41	42	42	41

	SAT	PI	COMM	ROLE	SUPPORT	EXPECT
COMM	0.45827	0.38415	1.00000	0.16207	0.41870	0.26463
	0.0026	0.0132	0.0000	0.3114	0.0064	0.0989
	41	41	41	41	41	40
ROLE	0.18532	0.03231	0.16207	1.00000	0.07679	0.19791
	0.2400	0.8390	0.3114	0.0000	0.6289	0.2148
	42	42	41	42	42	41
SUP-PORT	0.57615	0.23561	0.41870	0.07679	1.00000	0.67244
	0.0001	0.1331	0.0064	0.6289	0.0000	0.0001
	42	42	41	42	42	41
EX-PECT	0.46768	0.23485	0.26463	0.19791	0.67244	1.00000
	0.0018	0.1394	0.0989	0.2148	0.0001	0.0000
	42	41	40	41	41	42
EFF	0.76121	0.23265	0.36339	0.01043	0.51401	0.29803
	0.0001	0.1382	0.0195	0.9477	0.0005	0.0552
	43	42	41	42	42	42
TAC-TICS	0.40366	0.16698	0.17939	0.19205	0.39903	0.15794
	0.0080	0.2967	0.2680	0.2290	0.0098	0.3240
	42	41	40	41	41	41
INST	0.63224	0.43185	0.36896	0.05128	0.33893	0.41550
	0.0001	0.0043	0.0176	0.7471	0.0281	0.0062
	43	42	41	42	42	42
POS-PWR	0.32214	0.24041	0.28309	0.39894	0.31801	0.41409
	0.0375	0.1300	0.0767	0.0098	0.0427	0.0064
	42	41	40	41	41	42

	EFF	TACTICS	INST	POSPWR
SAT	0.76121	0.40366	0.63224	0.32214
	0.0001	0.0080	0.0001	0.0375
	43	42	43	42
PI	0.23265	0.16698	0.43185	0.24041
	0.1382	0.2967	0.0043	0.1300
	42	41	42	41
COMM	0.36339	0.17939	0.36896	0.28309
	0.0195	0.2680	0.0176	0.0767
	41	40	41	40

ROLE	0.01043	0.19205	0.05128	0.39894
	0.9477	0.2290	0.7471	0.0098
	42	41	42	41
SUPPORT	0.51401	0.39903	0.33893	0.31801
	0.0005	0.0098	0.0281	0.0427
	42	41	42	41
EXPECT	0.29803	0.15794	0.41550	0.41409
	0.0552	0.3240	0.0062	0.0064
	42	41	42	42
EFF	1.00000	0.38274	0.59908	0.33318
	0.0000	0.0124	0.0001	0.0311
	43	42	43	42
TACTICS	0.38274	1.00000	0.15718	0.20217
	0.0124	0.0000	0.3202	0.2049
	42	42	42	41
INST	0.59908	0.15718	1.00000	0.20226
	0.0001	0.3202	0.0000	0.1990
	43	42	43	42
POSPWR	0.33318	0.20217	0.20226	1.00000
	0.0311	0.2049	0.1990	0.0000
	42	41	42	42

STEPWISE REGRESSION PROCEDURE FOR

DEPENDENT VARIABLE SAT

WARNING: 6 OBSERVATIONS DELETED DUE TO

MISSING VALUES.

NOTE: SLENTRY AND SLSTAY HAVE BEEN SET TO

.15 FOR THE STEPWISE TECHNIQUE.

STEP 1 VARIABLE EFF ENTERED

R SQUARE = 0.45909527 C(P) = 6.96181805

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESS	1	1837.746	1837.746	31.40	0.0001
ERROR	37	2165.227	58.519		
TOTAL	38	4002.974			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	13.469				
EFF	0.986	0.175	1837.746	31.40	0.0001

BOUNDS ON CONDITION NUMBER: 1, 1

STEP 2 VARIABLE EXPECT ENTERED

R SQUARE = 0.53268147 C(P) = 3.25321424

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESS	2	2132.310	1066.155	20.52	0.0001
ERROR	36	1870.664	51.962		
TOTAL	38	4002.97435897			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	2.011				
EXPECT	0.275	0.115	294.563	5.67	0.0227
EFF	0.915	0.168	1533.079	29.50	0.0001

BOUNDS ON CONDITION NUMBER: 1.032338, 4.129351

STEP 3 VARIABLE COMM ENTERED

R SQUARE = 0.56354303 C(P) = 2.85906390

	DF	SUM OF SQUARES	MEAN SQUARE	F	PROB>F
REGRESS	3	2255.848	751.949	15.06	0.0001
ERROR	35	1747.126	49.917		
TOTAL	38	4002.974			

	B VALUE	STD ERROR	TYPE II SS	F	PROB>F
INTERCEPT	-0.244				
COMM	0.417	0.265	123.538	2.47	0.1247
EXPECT	0.239	0.115	213.460	4.28	0.0461
EFF	0.831	0.173	1145.847	22.95	0.0001

BOUNDS ON CONDITION NUMBER: 1.173867, 10.16547

NO OTHER VARIABLES MET THE 0.1500

SIGNIFICANCE LEVEL FOR ENTRY

SUMMARY OF STEPWISE REGRESSION PROCEDURE FOR

DEPENDENT VARIABLE SAT

STEP	VARIABLE ENTERED	NUMBER IN	PARTIAL R**2	MODEL R**2	C(P)
1	EFF	1	0.4591	0.4591	6.96182
2	EXPECT	2	0.0736	0.5327	3.25321
3	COMM	3	0.0309	0.5635	2.85906

STEP	VARIABLE ENTERED	F	PROB>F
1	EFF	31.4039	0.0001
2	EXPECT	5.6687	0.0227
3	COMM	2.4748	0.1247

OBS	SAT	PI	COMM	ROLE	SUP-PORT	EX-PECT	EFF	TAC-TICS	INST	POS-PWR
1	47	20	17	25	73	38	38	39	31	21
2	31	7	10	33	43	42	22	47	14	31
3	34	24	5	24	44	56	27	20	29	21
4	26	21	10	24	47	35	24	18	20	12
5	35	23	17	31	73	63	26	33	12	34
6	47	27	20	36	70	63	23	28	24	33
7	27	19	15	29	36	25	21	20	15	18
8	37	.	.	.	.	39	23	49	21	39
9	32	15	5	34	44	42	13	39	15	22
10	32	21	19	17	73	55	23	40	18	13
11	32	25	13	24	40	28	26	22	13	20
12	29	30	16	41	54	37	22	30	20	26
13	58	24	17	30	67	.	40	47	33	.
14	30	27	13	33	65	54	33	43	27	38
15	41	15	15	28	53	45	20	40	12	26
16	53	31	13	36	57	48	30	49	17	43
17	15	23	.	32	29	33	10	29	11	21
18	60	28	19	28	85	62	42	.	32	42
19	57	30	18	39	91	63	36	60	32	33
20	.	.	.	.	.	.	.	.	.	.
21	50	18	17	26	69	55	30	24	20	38
22	39	30	19	37	77	54	24	32	8	32
23	32	18	12	27	74	48	24	34	15	33
24	28	18	15	29	60	45	20	35	14	36
25	23	26	17	27	70	62	11	23	16	36
26	52	29	19	29	51	35	31	42	21	29
27	60	32	24	28	84	67	42	59	31	20
28	40	18	15	31	54	51	34	18	23	47
29	25	38	13	20	64	46	23	24	14	23
30	53	20	21	30	74	49	33	47	19	40
31	43	39	16	31	68	58	24	45	21	41
32	.	.	.	.	.	.	.	.	.	.
33	43	26	22	31	58	44	24	45	26	16
34	45	26	8	28	83	54	30	55	20	35
35	43	15	17	33	75	58	30	29	24	33
36	54	35	22	33	65	57	37	44	29	43
37	58	24	14	22	63	52	33	17	29	22
38	34	14	5	28	61	43	24	44	5	10
39	47	21	8	28	69	51	33	46	17	24
40	30	21	13	25	62	41	27	34	13	28
41	32	40	16	18	50	39	24	53	25	29
42	38	18	12	29	62	54	8	21	22	13
43	40	22	16	36	55	59	27	38	21	35
44	33	7	16	26	65	32	27	44	5	21
45	51	37	20	32	78	42	31	32	28	27

Appendix C: SAS Output for PROC RSQUARE

S A S   L O G   VMS SAS 5.16

```
options linesize=64;

data one;
        infile data1;
        input @1 sheet_1 $8. @10 (x1-x64) (1.)
                            #2 @20 (x65-x85) (1.);

        array a {85} x1-x85;

do I= 1 to 85;

        if a {I}=6 then a {I}=7;
        if a {I}=5 then a {I}=6;
        if a {I}=4 then a {I}=5;
        if a {I}=3 then a {I}=4;
        if a {I}=2 then a {I}=3;
        if a {I}=1 then a {I}=2;
        if a {I}=0 then a {I}=1;

end;


        sat=x54+x55+x56+x57+x58+x59+x60+x61+x62;
        pi=x1+x2+x3+x4+x5+x6+x7;
        comm=x8+x9+x10+x11+x12;
        role=x13+x14+x15+x16+x17+x18+x19;
        support=x20+x21+x22+x23+x24+x25+x26+x27+
                x28+x29+x30+x31+x32+x33+x34+x35
        expect=x36+x37+x38+x39+x40+x41+x42+x43+
                x44+x45+x46+x47;
        eff=x48+x49+x50+x51+x52+x53;
        tactics=x63+x64+x65+x66+x67+x68+x69+x70
                +x71+x72+x73;
        inst=x74+x75+x76+x77+x78;
        pospwr=x79+x80+x81+x82+x83+x84+x85;
```

```
NOTE: THE DATA SET WORK.ONE HAS 45 OBSERVATIONS
      AND 97 VARIABLES.
```

```
NOTE: MISSING VALUES WERE GENERATED AS A RESULT OF
      PERFORMING AN OPERATION ON MISSING VALUES.

 EACH PLACE IS GIVEN BY:
 (NUMBER OF TIMES) AT (LINE):(COLUMN).

 3 AT 24:10.
 3 AT 24:13.
 3 AT 24:16.
 3 AT 24:19.
 3 AT 24:22.
 3 AT 24:25.
 4 AT 25:12.
 4 AT 25:16.
 4 AT 25:20.
 4 AT 25:24.
 3 AT 26:14.
 3 AT 26:18.
 3 AT 26:22.
 3 AT 26:26.
 3 AT 26:30.
 3 AT 26:34.
 3 AT 27:45.
 3 AT 27:49.
 3 AT 27:53.
 3 AT 27:57.
 3 AT 27:61.
 3 AT 27:65.
 3 AT 27:69.
 3 AT 27:73.
 3 AT 28:52.
 3 AT 28:56.
 3 AT 32:16.
 3 AT 32:20.
 3 AT 32:24.
 3 AT 32:28.
 3 AT 32:32.
 3 AT 32:36.
 3 AT 30:29.
 3 AT 30:33.
 3 AT 30:37.
 3 AT 30:41.
 3 AT 30:45.
 3 AT 30:49.
 3 AT 30:53.
```

```
2 AT 23:13.
2 AT 23:17.
2 AT 23:21.
2 AT 23:25.
2 AT 23:29.
2 AT 23:33.
2 AT 23:37.
2 AT 23:41.
2 AT 28:32.
2 AT 28:36.
2 AT 28:40.
2 AT 28:44.
2 AT 28:48.
2 AT 29:13.
2 AT 29:17.
2 AT 29:21.
2 AT 29:25.
2 AT 29:29.
2 AT 30:17.
2 AT 30:21.
2 AT 30:25.
2 AT 31:14.
2 AT 31:18.
2 AT 31:22.
2 AT 31:26.
1 AT 27:17.
1 AT 27:21.
1 AT 27:25.
1 AT 27:29.
1 AT 27:33.
1 AT 27:37.
1 AT 27:41.
1 AT 28:16.
1 AT 28:20.
1 AT 28:24.
1 AT 28:28.
```

```
proc rsquare;
   model sat= pi comm role support expect eff
                  tactics inst pospwr;
```

WARNING: 6 OF 45 OBSERVATIONS OMITTED
DUE TO MISSING VALUES.

REGRESSION MODELS FOR DEPENDENT VARIABLE: SAT

IN	R-SQUARE	C(P)	VARIABLES IN MODEL
1	0.064057	37.6078	ROLE
1	0.067442	37.3452	PI
1	0.068454	37.2666	POSPWR
1	0.149696	30.9641	EXPECT
1	0.150350	30.9134	TACTICS
1	0.194268	27.5064	COMM
1	0.230266	24.7137	SUPPORT
1	0.303266	19.0506	INST
1	0.459095	6.96182	EFF

IN	R-SQUARE	C(P)	VARIABLES IN MODEL
2	0.092461	37.4042	ROLE POSPWR
2	0.110688	35.9903	PI POSPWR
2	0.126813	34.7393	PI ROLE
2	0.162693	31.9558	EXPECT POSPWR
2	0.177267	30.8252	ROLE EXPECT
2	0.181008	30.535	PI EXPECT
2	0.182366	30.4297	ROLE TACTICS
2	0.189391	29.8847	PI TACTICS
2	0.190257	29.8175	TACTICS POSPWR
2	0.204363	28.7232	PI COMM
2	0.217312	27.7186	COMM POSPWR
2	0.227362	26.939	COMM ROLE
2	0.242152	25.7917	SUPPORT EXPECT
2	0.251561	25.0617	SUPPORT POSPWR
2	0.253176	24.9365	PI SUPPORT
2	0.256786	24.6564	EXPECT TACTICS
2	0.267175	23.8504	ROLE SUPPORT
2	0.277294	23.0654	COMM EXPECT
2	0.277670	23.0362	SUPPORT TACTICS
2	0.294658	21.7184	COMM TACTICS
2	0.303460	21.0355	PI INST
2	0.304178	20.9799	COMM SUPPORT
2	0.340453	18.1658	INST POSPWR
2	0.343757	17.9094	EXPECT INST

IN	R-SQUARE	C(P)	VARIABLES IN MODEL
2	0.347974	17.5823	ROLE INST
2	0.374763	15.504	COMM INST
2	0.414127	12.4504	TACTICS INST
2	0.431335	11.1154	SUPPORT INST
2	0.464878	8.51323	EFF POSPWR
2	0.469706	8.1387	PI EFF
2	0.480786	7.27912	EFF TACTICS
2	0.507254	5.22581	ROLE EFF
2	0.510218	4.9959	COMM EFF
2	0.511151	4.92347	SUPPORT EFF
2	0.517399	4.43878	EFF INST
2	0.532681	3.25321	EXPECT EFF
3	0.139536	35.7523	PI ROLE POSPWR
3	0.180296	32.5903	ROLE EXPECT POSPWR
3	0.188754	31.9341	PI EXPECT POSPWR
3	0.201417	30.9517	ROLE TACTICS POSPWR
3	0.209626	30.315	PI ROLE EXPECT
3	0.215837	29.8331	PI TACTICS POSPWR
3	0.221160	29.4202	PI ROLE TACTICS
3	0.223616	29.2296	PI COMM POSPWR
3	0.234533	28.3827	COMM ROLE POSPWR
3	0.238548	28.0712	PI COMM ROLE
3	0.255697	26.7409	SUPPORT EXPECT POSPWR
3	0.261993	26.2524	PI SUPPORT EXPECT
3	0.262993	26.1749	EXPECT TACTICS POSPWR
3	0.267749	25.8059	PI SUPPORT POSPWR
3	0.269493	25.6706	ROLE EXPECT TACTICS
3	0.272332	25.4504	ROLE SUPPORT EXPECT
3	0.272397	25.4453	ROLE SUPPORT POSPWR
3	0.274767	25.2615	PI EXPECT TACTICS
3	0.279750	24.8749	COMM EXPECT POSPWR
3	0.280692	24.8019	PI COMM EXPECT
3	0.289704	24.1027	PI ROLE SUPPORT
3	0.293017	23.8457	COMM ROLE EXPECT
3	0.294438	23.7354	SUPPORT TACTICS POSPWR
3	0.295454	23.6567	SUPPORT EXPECT TACTICS
3	0.295465	23.6558	PI SUPPORT TACTICS
3	0.298920	23.3878	PI COMM TACTICS
3	0.302809	23.086	ROLE SUPPORT TACTICS
3	0.307222	22.7437	COMM TACTICS POSPWR
3	0.308819	22.6198	PI COMM SUPPORT
3	0.311002	22.4504	COMM ROLE TACTICS
3	0.313827	22.2313	COMM SUPPORT POSPWR

IN	R-SQUARE	C(P)	VARIABLES IN MODEL
3	0.316697	22.0086	COMM SUPPORT EXPECT
3	0.329440	21.0201	COMM ROLE SUPPORT
3	0.341007	20.1227	PI INST POSPWR
3	0.343759	19.9093	PI EXPECT INST
3	0.348153	19.5684	PI ROLE INST
3	0.349410	19.4709	COMM SUPPORT TACTICS
3	0.356328	18.9342	COMM EXPECT TACTICS
3	0.359170	18.7137	EXPECT INST POSPWR
3	0.360769	18.5897	ROLE INST POSPWR
3	0.372821	17.6547	ROLE EXPECT INST
3	0.378296	17.23	PI COMM INST
3	0.392770	16.1072	COMM INST POSPWR
3	0.402447	15.3564	COMM EXPECT INST
3	0.404754	15.1774	COMM ROLE INST
3	0.415136	14.3721	PI TACTICS INST
3	0.431617	13.0935	SUPPORT EXPECT INST
3	0.432831	12.9993	PI SUPPORT INST
3	0.434496	12.8701	TACTICS INST POSPWR
3	0.436500	12.7147	ROLE TACTICS INST
3	0.438353	12.571	EXPECT TACTICS INST
3	0.444340	12.1065	SUPPORT INST POSPWR
3	0.454660	11.3059	COMM SUPPORT INST
3	0.460634	10.8424	ROLE SUPPORT INST
3	0.463061	10.6542	COMM TACTICS INST
3	0.473192	9.86826	PI EFF POSPWR
3	0.476845	9.58481	SUPPORT TACTICS INST
3	0.485102	8.9443	EFF TACTICS POSPWR
3	0.488938	8.64669	PI EFF TACTICS
3	0.507749	7.18744	ROLE EFF POSPWR
3	0.511169	6.92211	PI COMM EFF
3	0.511426	6.90215	COMM EFF POSPWR
3	0.512781	6.79706	SUPPORT EFF POSPWR
3	0.515759	6.56598	PI SUPPORT EFF
3	0.516730	6.49065	PI ROLE EFF
3	0.517475	6.43288	PI EFF INST
3	0.518529	6.35108	SUPPORT EFF TACTICS
3	0.518546	6.34979	ROLE EFF TACTICS
3	0.523765	5.94491	EFF INST POSPWR
3	0.528531	5.57522	COMM EFF TACTICS
3	0.533510	5.18895	EXPECT EFF POSPWR
3	0.535365	5.04507	PI EXPECT EFF
3	0.538065	4.83556	COMM SUPPORT EFF
3	0.538537	4.79896	SUPPORT EXPECT EFF
3	0.544692	4.3215	COMM ROLE EFF
3	0.546484	4.18243	EXPECT EFF TACTICS
3	0.547561	4.09892	EFF TACTICS INST

IN	R-SQUARE	C(P)	VARIABLES IN MODEL
3	0.548527	4.02395	ROLE SUPPORT EFF
3	0.549217	3.97044	COMM EFF INST
3	0.558546	3.24669	ROLE EXPECT EFF
3	0.559264	3.19101	EXPECT EFF INST
3	0.559587	3.16597	ROLE EFF INST
3	0.563543	2.85906	COMM EXPECT EFF
3	0.564308	2.79974	SUPPORT EFF INST

IN	R-SQUARE	C(P)	VARIABLES IN MODEL
4	0.210221	32.2688	PI ROLE EXPECT POSPWR
4	0.230435	30.7007	PI ROLE TACTICS POSPWR
4	0.243113	29.7171	PI COMM ROLE POSPWR
4	0.271093	27.5465	ROLE EXPECT TACTICS POSPWR
4	0.271157	27.5415	PI SUPPORT EXPECT POSPWR
4	0.275298	27.2203	ROLE SUPPORT EXPECT POSPWR
4	0.278438	26.9767	PI EXPECT TACTICS POSPWR
4	0.282634	26.6512	PI COMM EXPECT POSPWR
4	0.288770	26.1752	PI ROLE EXPECT TACTICS
4	0.291632	25.9532	PI ROLE SUPPORT POSPWR
4	0.292897	25.855	PI ROLE SUPPORT EXPECT
4	0.293031	25.8446	COMM ROLE EXPECT POSPWR
4	0.297387	25.5067	PI COMM ROLE EXPECT
4	0.303409	25.0395	SUPPORT EXPECT TACTICS POSPWR
4	0.307111	24.7523	PI SUPPORT TACTICS POSPWR
4	0.307769	24.7012	ROLE SUPPORT TACTICS POSPWR
4	0.309624	24.5574	PI SUPPORT EXPECT TACTICS
4	0.309818	24.5424	PI COMM TACTICS POSPWR
4	0.312904	24.3029	ROLE SUPPORT EXPECT TACTICS
4	0.315473	24.1036	COMM ROLE TACTICS POSPWR
4	0.316149	24.0512	PI COMM ROLE TACTICS
4	0.316940	23.9898	PI COMM SUPPORT POSPWR
4	0.319833	23.7662	PI COMM SUPPORT EXPECT
4	0.320808	23.6898	COMM SUPPORT EXPECT POSPWR
4	0.320921	23.681	PI ROLE SUPPORT TACTICS
4	0.330814	22.9135	COMM ROLE SUPPORT POSPWR
4	0.334901	22.5964	PI COMM ROLE SUPPORT
4	0.336021	22.5096	COMM ROLE SUPPORT EXPECT
4	0.351974	21.272	PI COMM SUPPORT TACTICS
4	0.356214	20.9431	COMM SUPPORT TACTICS POSPWR
4	0.356972	20.8843	COMM EXPECT TACTICS POSPWR
4	0.357343	20.8555	PI COMM EXPECT TACTICS
4	0.359731	20.6702	PI EXPECT INST POSPWR
4	0.360885	20.5807	PI ROLE INST POSPWR
4	0.363212	20.4001	COMM ROLE EXPECT TACTICS
4	0.365275	20.2401	COMM ROLE SUPPORT TACTICS

IN	R-SQUARE	C(P)	VARIABLES IN MODEL
4	0.367812	20.0433	COMM SUPPORT EXPECT TACTICS
4	0.372823	19.6546	PI ROLE EXPECT INST
4	0.376943	19.335	ROLE EXPECT INST POSPWR
4	0.398983	17.6251	PI COMM INST POSPWR
4	0.406854	17.0145	PI COMM EXPECT INST
4	0.407531	16.962	PI COMM ROLE INST
4	0.408509	16.8862	COMM EXPECT INST POSPWR
4	0.409565	16.8042	COMM ROLE INST POSPWR
4	0.422470	15.8031	COMM ROLE EXPECT INST
4	0.433132	14.976	PI SUPPORT EXPECT INST
4	0.437291	14.6533	PI ROLE TACTICS INST
4	0.437813	14.6128	PI TACTICS INST POSPWR
4	0.440017	14.4418	PI EXPECT TACTICS INST
4	0.444439	14.0988	ROLE TACTICS INST POSPWR
4	0.446596	13.9315	EXPECT TACTICS INST POSPWR
4	0.447582	13.855	SUPPORT EXPECT INST POSPWR
4	0.447737	13.843	PI SUPPORT INST POSPWR
4	0.452847	13.4465	ROLE EXPECT TACTICS INST
4	0.454665	13.3055	COMM SUPPORT EXPECT INST
4	0.460479	12.8544	PI COMM SUPPORT INST
4	0.461946	12.7407	PI ROLE SUPPORT INST
4	0.462685	12.6833	COMM SUPPORT INST POSPWR
4	0.462853	12.6703	ROLE SUPPORT INST POSPWR
4	0.463273	12.6377	ROLE SUPPORT EXPECT INST
4	0.471218	12.0214	PI COMM TACTICS INST
4	0.472541	11.9187	COMM TACTICS INST POSPWR
4	0.476908	11.58	SUPPORT EXPECT TACTICS INST
4	0.478119	11.486	COMM ROLE TACTICS INST
4	0.478427	11.4621	COMM ROLE SUPPORT INST
4	0.480086	11.3334	COMM EXPECT TACTICS INST
4	0.480188	11.3255	PI SUPPORT TACTICS INST
4	0.486439	10.8405	SUPPORT TACTICS INST POSPWR
4	0.491561	10.4432	PI EFF TACTICS POSPWR
4	0.495917	10.1053	ROLE SUPPORT TACTICS INST
4	0.499106	9.85792	COMM SUPPORT TACTICS INST
4	0.512144	8.84642	PI COMM EFF POSPWR
4	0.516682	8.49444	PI SUPPORT EFF POSPWR
4	0.518370	8.36343	PI ROLE EFF POSPWR
4	0.518966	8.31721	ROLE EFF TACTICS POSPWR
4	0.519974	8.23906	SUPPORT EFF TACTICS POSPWR
4	0.522622	8.03363	PI SUPPORT EFF TACTICS
4	0.523814	7.94109	PI EFF INST POSPWR
4	0.526396	7.7408	PI ROLE EFF TACTICS
4	0.528959	7.54202	PI COMM EFF TACTICS
4	0.529225	7.52139	COMM EFF TACTICS POSPWR
4	0.536572	6.95137	PI EXPECT EFF POSPWR

IN	R-SQUARE	C(P)	VARIABLES IN MODEL
4	0.538344	6.81393	COMM SUPPORT EFF POSPWR
4	0.538474	6.80386	PI COMM SUPPORT EFF
4	0.538974	6.76509	SUPPORT EXPECT EFF POSPWR
4	0.540844	6.61995	PI SUPPORT EXPECT EFF
4	0.545994	6.22044	PI COMM ROLE EFF
4	0.546527	6.17913	COMM SUPPORT EFF TACTICS
4	0.546973	6.14453	COMM ROLE EFF POSPWR
4	0.547539	6.10062	EXPECT EFF TACTICS POSPWR
4	0.547822	6.07862	PI EFF TACTICS INST
4	0.548404	6.03349	PI EXPECT EFF TACTICS
4	0.548594	6.01874	SUPPORT EXPECT EFF TACTICS
4	0.550703	5.85515	ROLE SUPPORT EFF POSPWR
4	0.550889	5.84074	PI COMM EFF INST
4	0.551353	5.80475	COMM EFF INST POSPWR
4	0.551419	5.79958	ROLE SUPPORT EFF TACTICS
4	0.552154	5.74261	EFF TACTICS INST POSPWR
4	0.552953	5.68065	PI ROLE SUPPORT EFF
4	0.555061	5.51706	COMM ROLE EFF TACTICS
4	0.559275	5.19013	EXPECT EFF INST POSPWR
4	0.559311	5.18739	PI EXPECT EFF INST
4	0.559654	5.16079	PI ROLE EFF INST
4	0.559723	5.15545	ROLE EFF INST POSPWR
4	0.561568	5.01229	PI ROLE EXPECT EFF
4	0.563544	4.859	PI COMM EXPECT EFF
4	0.564815	4.76035	COMM SUPPORT EXPECT EFF
4	0.564893	4.75433	PI SUPPORT EFF INST
4	0.565183	4.73183	ROLE SUPPORT EXPECT EFF
4	0.566088	4.6616	COMM EXPECT EFF POSPWR
4	0.566407	4.6369	SUPPORT EFF INST POSPWR
4	0.566752	4.61011	ROLE EXPECT EFF TACTICS
4	0.568151	4.50158	COMM ROLE SUPPORT EFF
4	0.568353	4.48591	ROLE EXPECT EFF POSPWR
4	0.571736	4.22352	SUPPORT EXPECT EFF INST
4	0.574863	3.98091	COMM EFF TACTICS INST
4	0.576062	3.88785	COMM EXPECT EFF TACTICS
4	0.577651	3.7646	SUPPORT EFF TACTICS INST
4	0.577700	3.76082	ROLE EFF TACTICS INST
4	0.578284	3.71551	COMM SUPPORT EFF INST
4	0.579891	3.59086	EXPECT EFF TACTICS INST
4	0.581813	3.44174	COMM ROLE EFF INST
4	0.582109	3.41874	COMM EXPECT EFF INST
4	0.583386	3.31973	COMM ROLE EXPECT EFF
4	0.585987	3.11793	ROLE EXPECT EFF INST
4	0.597099	2.25589	ROLE SUPPORT EFF INST

IN	R-SQUARE	C(P)	VARIABLES IN MODEL
5	0.289060	28.1527	PI ROLE EXPECT TACTICS POSPWR
5	0.293800	27.7849	PI ROLE SUPPORT EXPECT POSPWR
5	0.297410	27.5049	PI COMM ROLE EXPECT POSPWR
5	0.314827	26.1537	ROLE SUPPORT EXPECT TACTICS POSPWR
5	0.314911	26.1472	PI SUPPORT EXPECT TACTICS POSPWR
5	0.319259	25.8099	PI COMM ROLE TACTICS POSPWR
5	0.322957	25.523	PI ROLE SUPPORT TACTICS POSPWR
5	0.323289	25.4973	PI COMM SUPPORT EXPECT POSPWR
5	0.328176	25.1182	PI ROLE SUPPORT EXPECT TACTICS
5	0.335560	24.5453	PI COMM ROLE SUPPORT POSPWR
5	0.336230	24.4933	COMM ROLE SUPPORT EXPECT POSPWR
5	0.340175	24.1873	PI COMM ROLE SUPPORT EXPECT
5	0.357853	22.8159	PI COMM EXPECT TACTICS POSPWR
5	0.357866	22.8149	PI COMM SUPPORT TACTICS POSPWR
5	0.363235	22.3984	COMM ROLE EXPECT TACTICS POSPWR
5	0.364684	22.2859	PI COMM ROLE EXPECT TACTICS
5	0.366511	22.1442	COMM ROLE SUPPORT TACTICS POSPWR
5	0.368531	21.9875	PI COMM ROLE SUPPORT TACTICS
5	0.368986	21.9523	PI COMM SUPPORT EXPECT TACTICS
5	0.369208	21.935	COMM SUPPORT EXPECT TACTICS POSPWR
5	0.377080	21.3243	PI ROLE EXPECT INST POSPWR
5	0.377377	21.3013	COMM ROLE SUPPORT EXPECT TACTICS
5	0.413846	18.4721	PI COMM ROLE INST POSPWR
5	0.414505	18.421	PI COMM EXPECT INST POSPWR
5	0.423260	17.7418	COMM ROLE EXPECT INST POSPWR
5	0.426015	17.5281	PI COMM ROLE EXPECT INST
5	0.446664	15.9262	PI ROLE TACTICS INST POSPWR
5	0.449800	15.6829	PI EXPECT TACTICS INST POSPWR
5	0.451504	15.5507	PI SUPPORT EXPECT INST POSPWR
5	0.454170	15.3439	PI ROLE EXPECT TACTICS INST
5	0.455338	15.2533	ROLE EXPECT TACTICS INST POSPWR
5	0.460482	14.8542	PI COMM SUPPORT EXPECT INST
5	0.463946	14.5855	COMM SUPPORT EXPECT INST POSPWR
5	0.464631	14.5324	PI ROLE SUPPORT EXPECT INST
5	0.464959	14.5069	PI ROLE SUPPORT INST POSPWR
5	0.467310	14.3246	ROLE SUPPORT EXPECT INST POSPWR
5	0.470572	14.0715	PI COMM SUPPORT INST POSPWR
5	0.479312	13.3934	COMM ROLE SUPPORT INST POSPWR
5	0.479674	13.3654	COMM ROLE SUPPORT EXPECT INST
5	0.480246	13.321	PI SUPPORT EXPECT TACTICS INST

IN	R-SQUARE	C(P)	VARIABLES IN MODEL
5	0.480935	13.2676	COMM ROLE TACTICS INST POSPWR
5	0.482976	13.1092	COMM EXPECT TACTICS INST POSPWR
5	0.483270	13.0864	PI COMM TACTICS INST POSPWR
5	0.483281	13.0856	PI COMM ROLE SUPPORT INST
5	0.485057	12.9478	PI COMM ROLE TACTICS INST
5	0.487151	12.7853	SUPPORT EXPECT TACTICS INST POSPWR
5	0.488951	12.6457	PI COMM EXPECT TACTICS INST
5	0.489994	12.5648	COMM ROLE EXPECT TACTICS INST
5	0.491969	12.4116	PI SUPPORT TACTICS INST POSPWR
5	0.496445	12.0644	ROLE SUPPORT EXPECT TACTICS INST
5	0.497968	11.9462	ROLE SUPPORT TACTICS INST POSPWR
5	0.498809	11.8809	PI ROLE SUPPORT TACTICS INST
5	0.499596	11.8199	COMM SUPPORT EXPECT TACTICS INST
5	0.504577	11.4335	COMM SUPPORT TACTICS INST POSPWR
5	0.508137	11.1573	PI COMM SUPPORT TACTICS INST
5	0.513853	10.7139	COMM ROLE SUPPORT TACTICS INST
5	0.523442	9.96999	PI SUPPORT EFF TACTICS POSPWR
5	0.527789	9.63278	PI ROLE EFF TACTICS POSPWR
5	0.529538	9.49706	PI COMM EFF TACTICS POSPWR
5	0.538683	8.78766	PI COMM SUPPORT EFF POSPWR
5	0.541558	8.56462	PI SUPPORT EXPECT EFF POSPWR
5	0.546713	8.16472	COMM SUPPORT EFF TACTICS POSPWR
5	0.546744	8.16232	PI COMM SUPPORT EFF TACTICS
5	0.548875	7.99694	PI COMM ROLE EFF POSPWR
5	0.549337	7.96113	SUPPORT EXPECT EFF TACTICS POSPWR
5	0.549810	7.92447	PI EXPECT EFF TACTICS POSPWR
5	0.550388	7.87958	PI SUPPORT EXPECT EFF TACTICS
5	0.553021	7.67537	PI EFF TACTICS INST POSPWR
5	0.553354	7.64946	ROLE SUPPORT EFF TACTICS POSPWR
5	0.553703	7.62246	PI COMM EFF INST POSPWR
5	0.555531	7.48058	PI ROLE SUPPORT EFF TACTICS
5	0.555834	7.45711	PI COMM ROLE EFF TACTICS
5	0.556369	7.41558	PI ROLE SUPPORT EFF POSPWR
5	0.557156	7.35454	COMM ROLE EFF TACTICS POSPWR
5	0.559315	7.18702	PI EXPECT EFF INST POSPWR
5	0.559843	7.14613	PI ROLE EFF INST POSPWR
5	0.564815	6.76035	PI COMM SUPPORT EXPECT EFF
5	0.566098	6.66087	PI COMM EXPECT EFF POSPWR
5	0.566927	6.59652	COMM SUPPORT EXPECT EFF POSPWR
5	0.567480	6.55365	PI SUPPORT EFF INST POSPWR

IN	R-SQUARE	C(P)	VARIABLES IN MODEL
5	0.567785	6.52999	PI ROLE SUPPORT EXPECT EFF
5	0.568827	6.44916	PI COMM ROLE SUPPORT EFF
5	0.569099	6.42803	PI ROLE EXPECT EFF TACTICS
5	0.570119	6.34892	ROLE SUPPORT EXPECT EFF TACTICS
5	0.571870	6.21309	COMM ROLE SUPPORT EFF POSPWR
5	0.571891	6.21145	SUPPORT EXPECT EFF INST POSPWR
5	0.572037	6.20013	COMM ROLE SUPPORT EFF TACTICS
5	0.572215	6.1863	PI SUPPORT EXPECT EFF INST
5	0.573019	6.12397	PI ROLE EXPECT EFF POSPWR
5	0.573517	6.08529	ROLE SUPPORT EXPECT EFF POSPWR
5	0.575854	5.90401	ROLE EXPECT EFF TACTICS POSPWR
5	0.576087	5.88591	COMM SUPPORT EXPECT EFF TACTICS
5	0.576125	5.88303	PI COMM EXPECT EFF TACTICS
5	0.576252	5.87313	COMM EFF TACTICS INST POSPWR
5	0.577775	5.755	ROLE EFF TACTICS INST POSPWR
5	0.577831	5.75065	PI ROLE EFF TACTICS INST
5	0.578657	5.68653	PI COMM EFF TACTICS INST
5	0.578931	5.66531	COMM EXPECT EFF TACTICS POSPWR
5	0.578977	5.66173	PI SUPPORT EFF TACTICS INST
5	0.579066	5.65484	COMM SUPPORT EFF INST POSPWR
5	0.579495	5.62156	SUPPORT EFF TACTICS INST POSPWR
5	0.579911	5.58929	EXPECT EFF TACTICS INST POSPWR
5	0.580572	5.53799	PI EXPECT EFF TACTICS INST
5	0.581182	5.49066	PI COMM SUPPORT EFF INST
5	0.582807	5.36466	COMM EXPECT EFF INST POSPWR
5	0.582920	5.35586	COMM ROLE EFF INST POSPWR
5	0.582949	5.35363	PI COMM ROLE EFF INST
5	0.583439	5.31556	PI COMM ROLE EXPECT EFF
5	0.584430	5.23874	PI COMM EXPECT EFF INST
5	0.585354	5.16701	COMM ROLE SUPPORT EXPECT EFF
5	0.585951	5.12072	SUPPORT EXPECT EFF TACTICS INST
5	0.586006	5.11642	PI ROLE EXPECT EFF INST
5	0.587316	5.01481	COMM SUPPORT EXPECT EFF INST
5	0.591270	4.70812	COMM ROLE EXPECT EFF TACTICS
5	0.591322	4.70402	ROLE EXPECT EFF INST POSPWR
5	0.591928	4.65707	COMM SUPPORT EFF TACTICS INST
5	0.595998	4.34133	COMM ROLE EXPECT EFF POSPWR
5	0.597557	4.22035	PI ROLE SUPPORT EFF INST
5	0.598037	4.18313	COMM ROLE EFF TACTICS INST
5	0.598344	4.1593	ROLE SUPPORT EFF INST POSPWR
5	0.599610	4.06106	ROLE EXPECT EFF TACTICS INST
5	0.599765	4.04907	ROLE SUPPORT EXPECT EFF INST
5	0.600353	4.00345	COMM EXPECT EFF TACTICS INST
5	0.603397	3.76733	COMM ROLE EXPECT EFF INST
5	0.604244	3.70156	ROLE SUPPORT EFF TACTICS INST
5	0.606492	3.52724	COMM ROLE SUPPORT EFF INST

IN	R-SQUARE	C(P)	VARIABLES IN MODEL
6	0.328718	27.0761	PI ROLE SUPPORT EXPECT TACTICS POSPWR
6	0.340213	26.1844	PI COMM ROLE SUPPORT EXPECT POSPWR
6	0.364779	24.2786	PI COMM ROLE EXPECT TACTICS POSPWR
6	0.369230	23.9333	PI COMM ROLE SUPPORT TACTICS POSPWR
6	0.370174	23.86	PI COMM SUPPORT EXPECT TACTICS POSPWR
6	0.377387	23.3005	COMM ROLE SUPPORT EXPECT TACTICS POSPWR
6	0.379166	23.1625	PI COMM ROLE SUPPORT EXPECT TACTICS
6	0.427480	19.4145	PI COMM ROLE EXPECT INST POSPWR
6	0.457536	17.0828	PI ROLE EXPECT TACTICS INST POSPWR
6	0.469859	16.1268	PI ROLE SUPPORT EXPECT INST POSPWR
6	0.472105	15.9526	PI COMM SUPPORT EXPECT INST POSPWR
6	0.481436	15.2287	COMM ROLE SUPPORT EXPECT INST POSPWR
6	0.484444	14.9953	PI COMM ROLE SUPPORT EXPECT INST
6	0.485015	14.951	PI COMM ROLE SUPPORT INST POSPWR
6	0.489637	14.5925	PI COMM ROLE TACTICS INST POSPWR
6	0.490373	14.5354	COMM ROLE EXPECT TACTICS INST POSPWR
6	0.492955	14.3351	PI SUPPORT EXPECT TACTICS INST POSPWR
6	0.493321	14.3067	PI COMM EXPECT TACTICS INST POSPWR
6	0.497712	13.9661	PI COMM ROLE EXPECT TACTICS INST
6	0.499332	13.8404	PI ROLE SUPPORT EXPECT TACTICS INST
6	0.499338	13.8399	ROLE SUPPORT EXPECT TACTICS INST POSPWR
6	0.501991	13.6341	PI ROLE SUPPORT TACTICS INST POSPWR

IN	R-SQUARE	C(P)	VARIABLES IN MODEL
6	0.504600	13.4317	COMM SUPPORT EXPECT TACTICS INST POSPWR
6	0.508705	13.1132	PI COMM SUPPORT EXPECT TACTICS INST
6	0.513893	12.7107	COMM ROLE SUPPORT EXPECT TACTICS INST
6	0.514628	12.6537	COMM ROLE SUPPORT TACTICS INST POSPWR
6	0.515632	12.5758	PI COMM SUPPORT TACTICS INST POSPWR
6	0.521609	12.1122	PI COMM ROLE SUPPORT TACTICS INST
6	0.546888	10.1511	PI COMM SUPPORT EFF TACTICS POSPWR
6	0.551431	9.7987	PI SUPPORT EXPECT EFF TACTICS POSPWR
6	0.558384	9.25925	PI COMM ROLE EFF TACTICS POSPWR
6	0.558618	9.2411	PI ROLE SUPPORT EFF TACTICS POSPWR
6	0.566939	8.59561	PI COMM SUPPORT EXPECT EFF POSPWR
6	0.572304	8.17943	PI ROLE SUPPORT EXPECT EFF TACTICS
6	0.572514	8.16311	PI SUPPORT EXPECT EFF INST POSPWR
6	0.572515	8.16302	PI COMM ROLE SUPPORT EFF TACTICS
6	0.573099	8.11774	PI COMM ROLE SUPPORT EFF POSPWR
6	0.575430	7.93687	COMM ROLE SUPPORT EFF TACTICS POSPWR
6	0.576146	7.88134	PI COMM SUPPORT EXPECT EFF TACTICS
6	0.577599	7.76862	PI ROLE SUPPORT EXPECT EFF POSPWR
6	0.577870	7.7476	PI ROLE EFF TACTICS INST POSPWR
6	0.578292	7.71491	ROLE SUPPORT EXPECT EFF TACTICS POSPWR
6	0.578941	7.66452	COMM SUPPORT EXPECT EFF TACTICS POSPWR
6	0.578945	7.66421	PI COMM EXPECT EFF TACTICS POSPWR
6	0.579651	7.60945	PI ROLE EXPECT EFF TACTICS POSPWR
6	0.580572	7.53799	PI EXPECT EFF TACTICS INST POSPWR

IN	R-SQUARE	C(P)	VARIABLES IN MODEL
6	0.580846	7.51672	PI COMM EFF TACTICS INST POSPWR
6	0.581482	7.46739	PI SUPPORT EFF TACTICS INST POSPWR
6	0.582490	7.38922	PI COMM SUPPORT EFF INST POSPWR
6	0.583703	7.29509	PI COMM ROLE EFF INST POSPWR
6	0.584809	7.2093	PI COMM EXPECT EFF INST POSPWR
6	0.585427	7.16137	PI COMM ROLE SUPPORT EXPECT EFF
6	0.586001	7.11686	SUPPORT EXPECT EFF TACTICS INST POSPWR
6	0.587133	7.02902	PI SUPPORT EXPECT EFF TACTICS INST
6	0.587478	7.00223	COMM SUPPORT EXPECT EFF INST POSPWR
6	0.590117	6.79755	PI COMM SUPPORT EXPECT EFF INST
6	0.591270	6.70807	PI COMM ROLE EXPECT EFF TACTICS
6	0.591436	6.69524	PI ROLE EXPECT EFF INST POSPWR
6	0.591643	6.67914	COMM ROLE SUPPORT EXPECT EFF TACTICS
6	0.592544	6.60927	COMM SUPPORT EFF TACTICS INST POSPWR
6	0.596388	6.31106	PI COMM ROLE EXPECT EFF POSPWR
6	0.596426	6.30807	PI COMM SUPPORT EFF TACTICS INST
6	0.596933	6.26873	COMM ROLE SUPPORT EXPECT EFF POSPWR
6	0.598557	6.14282	PI ROLE SUPPORT EFF INST POSPWR
6	0.598908	6.11555	COMM ROLE EFF TACTICS INST POSPWR
6	0.600036	6.02805	PI ROLE EXPECT EFF TACTICS INST
6	0.600172	6.01753	PI ROLE SUPPORT EXPECT EFF INST
6	0.600700	5.9765	PI COMM ROLE EFF TACTICS INST
6	0.601045	5.94978	COMM EXPECT EFF TACTICS INST POSPWR
6	0.601954	5.87928	COMM SUPPORT EXPECT EFF TACTICS INST
6	0.603056	5.79375	ROLE SUPPORT EXPECT EFF INST POSPWR
6	0.603079	5.79199	COMM ROLE EXPECT EFF TACTICS POSPWR
6	0.603885	5.72945	ROLE EXPECT EFF TACTICS INST POSPWR
6	0.604592	5.67459	PI COMM EXPECT EFF TACTICS INST
6	0.605079	5.63686	PI COMM ROLE EXPECT EFF INST

IN	R-SQUARE	C(P)	VARIABLES IN MODEL
6	0.605170	5.62975	ROLE SUPPORT EFF TACTICS INST POSPWR
6	0.605191	5.62813	PI ROLE SUPPORT EFF TACTICS INST
6	0.607674	5.43551	ROLE SUPPORT EXPECT EFF TACTICS INST
6	0.608623	5.36192	PI COMM ROLE SUPPORT EFF INST
6	0.608660	5.35901	COMM ROLE SUPPORT EFF INST POSPWR
6	0.610281	5.23325	COMM ROLE SUPPORT EXPECT EFF INST
6	0.611204	5.16168	COMM ROLE EXPECT EFF INST POSPWR
6	0.614203	4.92901	COMM ROLE SUPPORT EFF TACTICS INST
6	0.615915	4.79617	COMM ROLE EXPECT EFF TACTICS INST
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7	0.379170	25.1622	PI COMM ROLE SUPPORT EXPECT TACTICS POSPWR
7	0.487373	16.7681	PI COMM ROLE SUPPORT EXPECT INST POSPWR
7	0.498863	15.8767	PI COMM ROLE EXPECT TACTICS INST POSPWR
7	0.503626	15.5073	PI ROLE SUPPORT EXPECT TACTICS INST POSPWR
7	0.514865	14.6353	COMM ROLE SUPPORT EXPECT TACTICS INST POSPWR
7	0.515694	14.571	PI COMM SUPPORT EXPECT TACTICS INST POSPWR
7	0.521621	14.1113	PI COMM ROLE SUPPORT EXPECT TACTICS INST
7	0.523435	13.9705	PI COMM ROLE SUPPORT TACTICS INST POSPWR
7	0.576374	9.86367	PI COMM ROLE SUPPORT EFF TACTICS POSPWR
7	0.578956	9.66337	PI COMM SUPPORT EXPECT EFF TACTICS POSPWR
7	0.581840	9.43962	PI ROLE SUPPORT EXPECT EFF TACTICS POSPWR
7	0.587335	9.01335	PI SUPPORT EXPECT EFF TACTICS INST POSPWR
7	0.590134	8.79623	PI COMM SUPPORT EXPECT EFF INST POSPWR

IN	R-SQUARE	C(P)	VARIABLES IN MODEL
7	0.591646	8.67889	PI COMM ROLE SUPPORT EXPECT EFF TACTICS
7	0.597340	8.23718	PI COMM ROLE SUPPORT EXPECT EFF POSPWR
7	0.597636	8.21425	PI COMM SUPPORT EFF TACTICS INST POSPWR
7	0.601099	7.9456	PI COMM ROLE EFF TACTICS INST POSPWR
7	0.602304	7.85208	COMM SUPPORT EXPECT EFF TACTICS INST POSPWR
7	0.603111	7.78947	PI ROLE SUPPORT EXPECT EFF INST POSPWR
7	0.603122	7.78863	COMM ROLE SUPPORT EXPECT EFF TACTICS POSPWR
7	0.603253	7.77851	PI COMM ROLE EXPECT EFF TACTICS POSPWR
7	0.603931	7.72591	PI ROLE EXPECT EFF TACTICS INST POSPWR
7	0.604873	7.65279	PI COMM EXPECT EFF TACTICS INST POSPWR
7	0.605792	7.58151	PI ROLE SUPPORT EFF TACTICS INST POSPWR
7	0.606386	7.53546	PI COMM SUPPORT EXPECT EFF TACTICS INST
7	0.608566	7.36635	PI ROLE SUPPORT EXPECT EFF TACTICS INST
7	0.610132	7.24483	PI COMM ROLE SUPPORT EFF INST POSPWR
7	0.610651	7.20459	ROLE SUPPORT EXPECT EFF TACTICS INST POSPWR
7	0.611852	7.11137	PI COMM ROLE EXPECT EFF INST POSPWR
7	0.612412	7.06799	PI COMM ROLE SUPPORT EXPECT EFF INST
7	0.615863	6.80021	COMM ROLE SUPPORT EXPECT EFF INST POSPWR
7	0.615953	6.79327	COMM ROLE SUPPORT EFF TACTICS INST POSPWR
7	0.617468	6.67571	PI COMM ROLE SUPPORT EFF TACTICS INST
7	0.618983	6.55817	COMM ROLE SUPPORT EXPECT EFF TACTICS INST
7	0.619086	6.5502	PI COMM ROLE EXPECT EFF TACTICS INST
7	0.622405	6.29276	COMM ROLE EXPECT EFF TACTICS INST POSPWR

IN	R-SQUARE	C(P)	VARIABLES IN MODEL
8	0.523724	15.9481	PI COMM ROLE SUPPORT EXPECT TACTICS INST POSPWR
8	0.603303	9.77462	PI COMM ROLE SUPPORT EXPECT EFF TACTICS POSPWR
8	0.606453	9.53024	PI COMM SUPPORT EXPECT EFF TACTICS INST POSPWR
8	0.610967	9.18008	PI ROLE SUPPORT EXPECT EFF TACTICS INST POSPWR
8	0.616900	8.71978	PI COMM ROLE SUPPORT EXPECT EFF INST POSPWR
8	0.618466	8.59834	PI COMM ROLE SUPPORT EFF TACTICS INST POSPWR
8	0.622328	8.29866	PI COMM ROLE SUPPORT EXPECT EFF TACTICS INST
8	0.624135	8.15855	PI COMM ROLE EXPECT EFF TACTICS INST POSPWR
8	0.624217	8.15212	COMM ROLE SUPPORT EXPECT EFF TACTICS INST POSPWR
9	0.626178	10	PI COMM ROLE SUPPORT EXPECT EFF TACTICS INST POSPWR

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Although many approaches and strategies have been introduced, a comprehensive model for predicting the successful implementation of information systems has not been developed prior to this research. There existed the need for developing a generalized instrument which could measure the contribution of participative systems design to system success as determined by user satisfaction. This paper developed such a model, by incorporating and testing nine independent variables to determine their influence on user satisfaction, without regard to a specific system.

A tentative model was built that associated likely independent variables with user satisfaction. The independent variables were obtained through a comprehensive review of the current literature. These are nine variables are perceived influence, communication, role conflict and ambiguity, support, expectancy, efficiency and effectiveness, tactics, institutionalization, and position power.

This tentative model was tested in a survey of United States Air Force managers. The survey sample population consisted of Program Managers and Logistics Managers from throughout the United States Air Force. The questionnaire employed a Likert-type scale for its method of measurement. Independent variables were evaluated on how well each discriminated between high and low levels of success, as determined by each survey recipient.

The purpose of this research was to develop a model that could predict successful information systems implementation. Such a model was developed. This implementation model includes three independent variables as significant in predicting user satisfaction. These three predictors are communication, expectancy, and efficiency/effectiveness.